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Railway Efficiency and Commercial Gratitude

A WELCOME example of increasing freights was recorded by Mr. Frank S. Russell, Chairman and Managing Director of General Refractories Limited when presiding last week at the annual meeting of that company. That business, of course, consists of the manufacture of heat-resisting and insulating material, and Mr. Russell pointed out that during the past year their combined output capacity of fire bricks of all kinds was no fewer than 26,000,000, and the number of works, mines, and quarries controlled was now 68, as against 41. The expenditure by the group on railway carriage was no less than £102,330, as against £73,246 in the previous year. Last year Mr. Russell stated that their expenditure in this direction appeared to entitle them to consideration by the railway companies when they were making purchases of refractories, and this year he took the opportunity of thanking them for 'their considerable support in that way during the year. He added that this seemed an appropriate moment to point out that General Refractories Limited and its subsidiaries were whole-hearted supporters of rail transport, and their expenditure on road haulage was a triviality. Finally it is gratifying to be able to state that Mr. Russell placed on record his appreciation of the efficient service rendered by the railways during the year. This example of commercial gratitude and tribute to railway efficiency is doubly welcome in view of the fact that the satisfied customer is usually inarticulate.

A Price on Politeness

One of the merits urged in favour of politeness is that it costs nothing. Those with whom such an argument carries most weight will be additionally impressed by the fact that the same virtue may also be made to bring its own very tangible reward. The French Tourist Commissioner, who is under the direction of the Minister for Public Works, has instituted a scheme whereby a sum of £350 has been allocated for prizes to railway employees and Customs officials who distinguish themselves by their courtesy and helpfulness towards foreign visitors. Nevertheless, politeness and readiness with information and advice are qualities which in principle it is not particularly desirable to evoke with the aid of a premium, because they ought not to demand any extra effort in their production. Their absence in an employee usually denotes a corresponding absence of interest in his work, and that may not be wholly due to a temperamental failing. Gloomy or neglected surroundings are reflected by an inertia among those who work in them. The brightening of stations, the improvement of the lineside and the extension of the men's interest to the activities of their company beyond their immediate horizon, all of which are practised in this country, may therefore have a more genuine and widespread result than the French premium for politeness.

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Transport for the Foreign Visitor

The recovery in the number of visitors to Great Britain from foreign countries, which has proceeded steadily since 1933, resulted in the 1935 total of 315,744 approaching to within 18,031 of the record for the past decade. A further improvement has been recorded so far this year, and if the rate of progress is maintained the final result should be noteworthy even at a period when increases of population are measured in units of quins and quads. Most of these people visit us on holiday, and are therefore potential travel customers. Being in an unfamiliar country, they attach importance to a transport service being easy to find and easy to use. These requirements are being fulfilled to a greater extent by the railways as electrification or other measures increase the frequency of trains and decrease the necessity of referring to timetables. That this advantage need not apply only to short-distance services is demonstrated by the scheme for systematised main line departures and connections on the French State Railways to which we referred in our issue of February 7. As to making a railway easy to find, or, more accurately, bringing its facilities to the attention at opportune moments, the distinctive and standardised direction signs displayed by the Southern Railway in towns served by the Eastbourne and Hastings electrification are examples of a British effort in this direction.

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The Goal of Research

Following the opening of the new L.M.S.R. research laboratory at Derby on December 10 last, it is interesting to record some views recently expressed by Mr. L. W. Wallace, Director of Equipment Research, Association of American Railroads. Mr. Wallace mentioned that, despite the economic depression, American railways had spent some $40 million on air-conditioning for passenger trains since 1932, and this was but one item of the expenditure that had been incurred in raising the standards of safety, speed, and efficiency offered to the traveller. The steam locomotive was taking its part along with diesel and electric power in maintaining the new accelerated schedules for passengers and freight, because research in its design had by 1930 decreased its fuel consumption per 1,000 ton-

miles by 24 per cent. compared with 1910, and by 22 per cent. compared even with 1920. This great increase in efficiency during a single decade had enabled total savings of $91,300,000 to be made in the railway fuel bill for 1929, while the economies over the 12 years ending in 1932 were almost $630 million. These figures were taken by Mr. Wallace to justify his contention that far from being moribund, the railway industry is on the threshold of one of the most active and fruitful eras in its history. On paper this is incontrovertible, but in practice it will depend upon whether the people decide to risk enjoying the increased wealth and leisure, from the higher yield per unit of input energy which is the constant pursuit of research.

* * * *

Overseas Railway Traffics

For Argentine railways the gross earnings for three-quarters of the financial year can now be calculated with the publication of the returns for the week ended March 28, which are not encouraging. Central Argentine traffic for that week was weakened by two wet days and the restricted movement of maize. For the 39 weeks this company's receipts in currency show an increase of 1,076,300 pesos or 1·37 per cent. The corresponding increase for the Buenos Ayres & Pacific is 4,368,000 pesos or 8·7 per cent., but the Buenos Ayres Great Southern records a decrease of 9,005,000 pesos or 9·36 per cent. Brazilian railways for the first quarter of the year have done well in currency receipts, but results in sterling have not been satisfactory except on the San Paulo.

	No. of Week	Weekly Traffics	Inc. or Decrease	Aggregate Traffic	Inc. or Decrease
		£	£	£	£
Buenos Ayres & Pacific ..	39th	101,586	— 11	3,206,445	+ 268,932
Buenos Ayres Great Southern ..	39th	158,578	— 22,853	5,119,075	— 508,494
Buenos Ayres Western	39th	46,945	— 6,278	1,732,870	+ 5,969
Central Argentine	39th	107,638	— 21,014	4,694,993	+ 87,667
Canadian Pacific	12th	472,200	+ 45,200	5,203,800	+ 503,200
Bombay, Baroda & Central India	51st	278,700	+ 40,200	8,109,150	+ 41,700

The increase in net earnings of the Canadian Pacific for the first two months of 1936 amounts to £85,200.

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Satisfying Railway Passengers

In a recent issue our American contemporary the *Railway Age* commented in pertinent and interesting fashion upon the subject of the relationship between railway employees and the travelling public. After remarking that "the satisfied customer is the best advertisement," our contemporary went on to say that the servicing of a passenger begins with the sale of his ticket, continues throughout his journey, and is finished only when he leaves the station at his destination. Whether he is satisfied or not depends upon the fare charged, the comfort and speed of the train, and whether it is on time. It also depends upon the way he is treated at the ticket window, on the train itself, in the dining car, and at both ends of his trip by the employees. There is a good deal of difference between the way in which travellers are treated by the employees of different railways, and our contemporary is disposed to blame the labour unions to some extent because of their frequent interference when, in response to a complaint from the passenger department, the operating department tries to discipline or discharge an employee for discourtesy or inattention to a passenger. The railways greatly need more passengers, and it is as much to the interest of the employees as of the railways to get them, seeing that the number of employees the railways can pay is determined by the amount of traffic they can get. No hotel, it is stated, would long keep an employee who offended guests, and as passengers should be treated as guests of the railway, their proper treatment should be insisted upon.

The Air Resistance of Passenger Trains

Reliable information concerning that part of train resistance which is due to the air is not easy to find even now, for, dissociated from the trains which provided the data on which they were grounded, most formulæ give erroneous and misleading information. Particularly is this so of formulæ which pretend to give the total resistance in lb. per ton, and which show this figure to be a function of the speed alone. Such a formula is wrong even for trains made up of the same types of locomotive and carriage as were used in the experimental runs, its indications being correct for only one particular length of train. For other lengths the coefficient of the V^2 term should be changed, which means that for purposes of quotation the formula in question should be bracketed with this particular length. Wind tunnel tests conducted in New York and recently described by G. W. Bell and A. Lipetz in the *Railway Mechanical Engineer* show that the air resistance is related to the perimeter of the train cross section and to the length, which appears raised to powers varying between 0·7 and 0·88 in the different formulæ. The common assumption that the V^2 component of train resistance is proportional to the weight makes it proportional to the length also. Actually the frontal and tail end resistances, which are more or less the same for long and short trains, are smaller per ton weight or per foot length for long than for short trains.

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Carelessness at Crossings

Particulars published in the Spanish railway press reveal remarkable carelessness on the part of drivers of road vehicles. In October last, for instance, there were six cases on the Norte system of motor vehicles being driven into closed barriers, doing much damage. In one case the motor crashed through on to the line and was caught by a train, two persons being killed and another seriously injured. In another case, presumably at an open crossing, a man tried to drive a cart across in front of a train, but was caught and badly hurt. On the M.Z.A. there were twelve cases of driving into the barriers, and three cases were reported from the other railways. Danger signals given by the watchmen were frequently ignored. The American Interstate Commerce Commission has carefully analysed the crossing accidents in the United States of recent years. Results for six months of 1935 show that of 1,625 cases of collision between trains and road vehicles, over 36 per cent. were due to the latter being driven into the side of trains, and nearly a fourth of these occurred in broad daylight. In the remaining cases road vehicles were caught by a train. *Railway Signaling* says that "although some of these collisions occurred because drivers of automobiles were drunk or asleep, or the crossing protecting devices were not in working order, the vast majority occurred under normal conditions to automobiles driven by apparently normal adults who probably were not sufficiently cautious or attentive."

* * * *

Splitting Distant Signals in Italy

With the opening of the new station at Florence on October 28 last, and the introduction of 3,000-volt d.c. electric traction on the Florence-Rome, Rome-Naples, Udine-Tarvisio, and Campeoleone-Nettuno lines, the Italian State Railways brought new signalling and operating regulations into force, with the object of making the signal aspects more complete and eliminating unnecessary speed restrictions and stops under certain conditions. Bracket signals have long been used as junction home signals, but until a year or so ago were preceded by a

single armed distant signal, cleared for all routes. If a train had to be sent by an unusual route, it had first to be stopped, unless the driver had been given a written notification beforehand. The new arrangements provide splitting distants, as shown on page 104 of our issue for January 18, 1935, and the rules prescribe a speed limit of 30 km.p.h. (18·6 m.p.h.) if an arm on a short doll post is cleared, thus giving the bracket signals in future the force of speed signals. The practice of mounting more than one stop arm on one doll is to be given up. Another interesting change concerns the use of fog signals. Three are to be laid down, 25 m. (82 ft.) apart, from 100 to 150 m. (109 to 163·5 yd.) in the rear of distant signals, but are to be kept on the rail all the time the fog lasts, instead of being removed when the signal is cleared; they will thus have the significance only of an approach warning. When used to support a stop signal, or in an emergency, they are to be placed 20 cm. (7·8 in.) apart, in order to produce the effect of one loud explosion.

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To Whistle or to Shout?

Among the assistant inspecting officers' reports of the more serious accidents to railway servants during the quarter ended June 30, 1935, was a very interesting one by Mr. Moore which raised the question as to the desirability of the more general use of whistles rather than the human voice for giving warning. Three men and a subganger were engaged in levelling the ballast on the down line at a point where a view of well over ¼-mile was available along the down line, and there was a 30-m.p.h. speed restriction. It was the opinion of the sub-ganger, Crawford, that there was no necessity for a look-out man under those conditions, and in that Mr. Moore quite agreed. The deceased man, Barnard, was the farthest of the four from the approaching train. One of the men saw a signal " off " for a down train, and gave a verbal warning; he then stood clear, and one of his colleagues did the same. A third man, who was already entirely clear of the track, carried on with his work. No one, however, noticed that Barnard had not moved, until the train was too close for him to be saved. A strong wind blowing in the down direction was suggested as the reason why Barnard did not hear the warning. It is unfortunate, therefore, that a whistle was not used. All the men appear to have been carrying them, but in such positions in their clothing that they could not be got at readily. Mr. Moore concludes his report by observing that " whistles are far more effective for giving warning than the human voice, and should always be carried in a convenient place where they can be produced quickly in an emergency; a point which might with advantage be watched by permanent way inspectors on their rounds."

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Rubber Springs in Railway Service

Mr. R. T. Glascodine, in his paper entitled " Impact of Railway Vehicles in Relation to Buffer Resistance " which he read before the Institution of Locomotive Engineers recently, discussed the influence upon the life of a rubber spring in railway service of the kind of work it has to do. When properly applied it has been found both in Britain and abroad that the general life is 15 to 17 years. On a foreign railway some 2,000 wagons were fitted many years ago with rubber springs. There were no replacements until the whole batch was renewed after 15 years, and the author quoted this fact to illustrate that the life of rubber springs is not an indeterminate quantity, but that under suitable conditions they may all be expected to give full life service. It has been known for the auxiliary bearing springs of a whole train to give service for 24 years before being renewed throughout. In the pre-war period, springs suitably applied gave a life of 15 to 17 years in buffers with limited stroke. Since the war, wagons do a greater mileage per annum, and this is ultimately reflected in the life of the buffing and draw springs. Locomotive draw springs, which always do full collar work, are expected to give a life of about 10 years, and locomotive auxiliary bearings springs should last 15 to 20 years. Carriage auxiliary bearing springs should give a similar life.

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British Steam Locomotives

At the end of 1935 the total number of steam locomotives owned by the four main line railways in this country was 20,165—a reduction of 204 on the total a year previously. It is significant of the continued use by British railways of locomotives of relatively small power that of the tender engines 2,248, or 18½ per cent. of the total, are still of the 4-4-0 type, and 4,920, or 40 per cent., of the 0-6-0 type. Similarly among the tank engines 3,061, or 38 per cent., are of the 0-6-0 type, and 1,500, or 19 per cent., of the 0-6-2 type. The only wheel arrangement of which the number of engines has been increased during 1935 by all four groups is the 4-6-0 tender, 1,616 at the end of 1934 and 1,698 at the end of 1935. The 2-6-2 tank type was also extensively added to during 1935, 74 by the L.M.S.R., 21 by the L.N.E.R., and 20 by the G.W.R., a total increase of 115. Among the larger locomotives, the eleven Pacifics put into service by the L.M.S.R. during 1935, and the five by the L.N.E.R. bring the total of this wheel arrangement to above 100 engines, of which 88 are owned by the L.N.E.R.; and completion of the present L.N.E.R. building programme will bring the L.N.E.R. 4-6-2 total alone to more than one hundred. The complete steam locomotive stock of each group, classified under wheel arrangements, at the end respectively of 1934 and 1935, appears on page 719 of this issue.

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Modern Locomotives

A paper entitled " The Modern Locomotive " was read by Mr. Benjamin Irving recently at a meeting of the North-East Coast Institution of Engineers and Shipbuilders at Newcastle-on-Tyne. In presenting some contrasts with marine practice, the author remarked that the steam production of a locomotive may reach 800 lb. of superheated steam per sq. ft. of grate per hr., something like 45 h.p., or 12 to 13 lb. per sq. ft. of evaporating heating surface, figures which can be exceeded by 10 per cent. if feedwater heating is resorted to. The marine boiler under natural draught does not burn more than 23 lb. of coal per sq. ft. of grate per hr., compared with 50 lb. to 150 lb. for the locomotive. If the locomotive were to work at 23 lb., the boiler efficiency would be 80 per cent., but the steam production would fall to 200 lb. per sq. ft., which is quite inadequate. In point of fact the locomotive boiler has to work very hard and is able to produce 1,500 lb. per hr. of superheated steam per ton of empty weight, or 1,000 lb. per ton of full weight. The heat losses look high, but that is the price paid for intensive working. What is required, among other things, is to reduce the smokebox temperature, that is, to absorb more than 85 per cent. of the available heat, which in other words means improving the circulation in the boiler. The working pressures range from 200 to 250 lb. in modern locomotives, or occasionally as high as 300 lb.

Indian Railways in 1934-35

THE report by the Railway Board on the Indian Railways for the year 1934-35 has been received. The board is in direct control of five State owned and managed railways, namely the East Indian, Great Indian Peninsula, North Western, Eastern Bengal, and Burma, which have a route mileage of 19,000. It also exercises a direct control on all important questions of finance and management over the following railways which are State-owned but are worked by companies under State guarantees, namely: Assam Bengal; Bengal-Nagpur; Bombay, Baroda & Central India; Madras & Southern Mahratta; and South Indian. A more limited control is exercised by the board over the company-owned Bengal & North Western and Rohilkund & Kumaon Railways, which have no guarantee, but work certain sections of State railway and share profits with the State. This latter control more resembles that exercised by the Ministry of Transport over railways in Great Britain. Altogether the capital of the railways in which the State has a financial interest amounts to 795 crores of rupees (approximately £596,000,000), with a route mileage of 31,600. Taking the State-owned railways the following figures are indicative of the year's results:—

	1934–35	1933–34	1929–30
	Per cent.	Per cent.	Per cent.
Operating ratio	69·9	71·4	66·4
Interest earned	3·3	3·1	4·4

There was a deficit of Rs. 5 crores, against 8 crores for the previous year, after taking into consideration renewals fund contributions, in the interest charges. A crore = £750,000. Gross receipts were divided up as follow:—

Passenger earnings	Rs.32·84 crores.
Goods earnings	Rs.61·05 ,,
Sundry earnings	Rs. 1·71 ,,

The freight receipts were higher than any of the previous four years, but passenger traffic receipts, whilst showing an increase over the previous year, were lower than those for 1930-1, 1931-2, and 1932-3. Comparing the year 1929-30 with the year 1934-35, the results for the latter show that receipts were 12½ per cent. below the former, and working expenses about 11½ per cent. lower. The general financial position of the State-owned railways is indicated in the accompanying table. It should be noted that the figures of gross traffic receipts shown in the table are arrived at after deducting refunds and earnings of worked lines.

	1934–35	1933–34	1932–33
	Rs. lakhs	Rs. lakhs	Rs. lakhs
Gross traffic receipts	90,20	86,63	84,43
Operating expenses	50,27	49,50	49,08
Depreciation fund	13,72	13,56	13,77
Net traffic receipts	26,21	23,57	21,58
Net miscellaneous receipts after deducting miscellaneous charges and profits payable to companies	53	1,05	1,10
Net revenue	26,74	24,62	22,68
Interest charges	31,80	32,58	32,91
Deficit	5,06	7,96	10,23

Net receipts improved on all the railways with the exception of the Madras & Southern Mahratta. The East Indian (an entirely State owned and managed railway) and the Bombay, Baroda & Central India Railway, a company-managed line, showed the best results. Striking reductions have been made in the Stores balances which have been reduced by over 45 per cent. since 1929-30. The report also discloses a marked decrease in claims paid for goods lost or damaged. The figures show a reduction of over 78 per cent.

For all Indian railways the mileage is 43,021. The number of passengers originating has fallen from 496 million in 1933-34 to 489 million in 1934-35, but originating tonnage, has, on the other hand, risen from 76·5 million to 84·5 million. The total earnings were 102·81 crores (approximately £77,000,000), of which 62 per cent. was obtained from freight traffic. The operating results for the principal railways may be summarised thus:—

Passenger miles increased	3·68 per cent.
Net ton miles increased	8·33 ,,

"Other" miles 16 per cent. of total engine miles, compared with 17 per cent.

	1934–35	1933–34
Engine miles per day per engine in use (broad gauge)	108	107
Loads of freight trains	391 tons.	391 tons.
Net ton miles per engine hour (broad gauge)	1,946	1,927
	Per cent.	Per cent.
Wagon miles per wagon day (broad gauge)	34·8	32·5
Punctuality of passenger trains (all trains, including electric services)	88·1	87·0

Some 71 miles of railways were opened during the year and several projects were under construction at its close. A large bridge over the Meghna river on the Assam Bengal Railway was authorised. An important scheme which will take some three years to complete has been commenced for the remodelling of the East Indian Railway workshops at Jamalpur. This is the largest locomotive workshop in India and was originally constructed about 1862. Jamalpur is situated in the area so extensively damaged by the earthquake in 1934, but the workshops themselves escaped to a large extent. Various other major schemes are referred to in the report, such as the remodelling of the wagon shops at Jhansi on the Great Indian Peninsula Railway and the remodelling of Delhi yard. A short description of the trouble experienced in connection with the very important Hardinge Bridge over the Ganges on the Eastern Bengal Railway was contained in the report for 1933-34. It will be remembered that serious wash-aways of the protection works for the bridge took place, and the recommendations for the further protection and permanent security of the bridge involve the expenditure of a large sum of money. A committee is working on the ultimate requirements, and certain experiments were being carried out with a working model of the river and the protection works by the Public Works Department Research Station at Poona.

Certain paragraphs in the report deal with the question of ticketless travel which has always been a problem on the Indian railways and is not unknown on railways in other parts of the British Empire. In India elaborate systems have been devised involving squads of travelling ticket collectors working to detailed plans and surprise checks. Additional steps have been taken on the East Indian Railway during the year. Road motor competition is growing in India and in some areas organised companies running motor services to regular timings and at fixed charges both for freight and passenger traffic have made their appearance. The question of the relationship between road and rail in a country of the size of India with 320,000,000 inhabitants is a problem of great magnitude. The railways themselves adopted numerous measures by reducing rates or improving services in order to combat motor competition. The report states that on the North Western Railway the newly organised Sales Branch has started canvassing for traffic in towns and villages.

There is a number of railway owned collieries in India and the output in 1934-35 was 2,792,735 tons, an increase of 285,535 tons over 1933-34. Many railways have to face a haul of 1,000 miles for locomotive coal which is thus a most important factor in railway expenditure. It

is interesting to note that in 1934 the coal mined in British India amounted to over 20,000,000 tons. As regards rolling stock and materials, no new engines were obtained as additions to the stock during the year, though over 200 engines were scrapped. The policy of obtaining materials from indigenous manufacture or sources was continued. Some 66,000 tons of rails were obtained from the Tata Iron and Steel Company. Carriage building with local timber was continued. Under the Railway Board there is a Central Standards Office which prepares designs for standard fittings for use on Indian railways both from the civil and mechanical engineering standpoints. In addition there are carriage and wagon, bridge, track, signalling, and locomotive standards committees which consist of representatives of different railways and which meet periodically to agree standard designs. Their work was continued throughout the year in question.

The total number of staff employed on Indian railways, including the Railway Board but excluding staff employed on construction, at the end of the year 1934-5 was 705,000, a rise of just over 3,000 compared with the previous year, due in part to works in areas affected by earthquake. Indianisation of the railways which has been the policy for some time was continued. In the higher ranks the percentage of Europeans and Indians has been fixed at 25 and 75 respectively; actually the figures are 38 and 62 so far as the State-managed railways are concerned. As an example of the progress of the policy of Indianisation, the report mentions that the Indian element in the superior grades has risen from 28 per cent. on company-managed railways in 1925 to 43 per cent. on State-managed and 36 per cent. on company-managed railways in 1935. Orders were issued in July, 1934, by the Government of India setting out the percentages to be adopted in recruitment of the different sections of the community, namely, Hindus, Muslims, Anglo-Indians, Sikhs, &c.: and there are complicated arrangements to be made in connection with this policy.

Considerable activity took place during the year under the heading of Publicity especially in connection with important religious festivals. Some 42,000 people visited the Railway Information Bureau at Victoria Terminus, Bombay, whilst wireless and cinemas were utilised in addition to posters, handbills, &c. On the North Western Railway a cinema car was introduced, the equipment in which included a movable power unit which was utilised for giving shows in places away from the railway where is was found necessary to advertise concessions. There is some interesting information in the report on the subject of the relationship of the railways to the State. The Indian railways play an enormously important part in the life of the country as a whole, and the railways are subjected to a very great deal of political interest amounting sometimes to interference. Out of a total number of 3,550 questions asked in both Houses of Parliament during the year 1934-35, 1,072 or 30 per cent. were answered by the Railway Department (*i.e.* the Railway Board).

The report makes reference to the visit of Mr. Pope of the L.M.S.R. to India, and gives some figures of the savings effected as a result of this. These refer principally to minor matters of internal railway administration; no mention is made in the report of the bigger questions of amalgamations of offices, workshops, and other activities as between the completely State-owned lines. Broadly speaking the railways previously company-managed, which are now completely State-owned and managed (the East Indian, Great Indian Peninsula, and Burma) have continued as separate entities since they ceased to be company-managed, and if the full benefits of unified state control are to be obtained it seems to us that a considerably greater degree of fusion of resources between the State railways should be made; for example, the headquarters of the Eastern Bengal and East Indian railways are in Calcutta, but they have separate accounting, stores, workshop, and administrative organisations.

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Co-Ordination of Transport in Great Britain

THE recent announcement that a committee of members of the Transport Advisory Council is to consider the problem of co-ordinating transport in Great Britain, really betokens a continuance of the comprehensive inquiries conducted by the Royal Commission on Transport some years ago. That commission was appointed in 1928, under the chairmanship of Sir Arthur Griffith-Boscawen, to consider problems arising out of the growth of road traffic; in order to use all means of transport (including coastwise shipping) to the greatest advantage, to consider and report upon measures for their better regulation and control; and, so far as desirable in the public interest, to promote co-ordinated working and development. After investigations which lasted many months, the commission issued a report in December, 1930, making recommendations for the improvement and development of the various forms of transport, namely, railways, road haulage, canals, and coastwise shipping. On the subject of co-ordination, however, the commission admitted very great difficulties, particularly in connection with merchandise traffic, and could see no positive solution. The adoption of coercive or compulsory measures to achieve this object was ruled out, and the appointment of a permanent advisory council was recommended, to advise the Minister of Transport upon means of promoting the co-ordination, improvement and development of transport generally, and in particular, the carriage of goods. By this means it was considered that the Minister could guide and assist the development of transport for the greatest benefit of the community. No immediate action was taken, but in April, 1932, the Minister set up a conference on Rail and Road Transport under the chairmanship of Sir Arthur Salter to consider, *inter alia*, measures likely to assist those responsible for the transport of goods by road and rail to carry out their functions under equitable conditions. The conference expressed the view that the best division of function would be evolved automatically from the efforts of those engaged in rail and road transport to co-ordinate their services. It also remarked that there was room for a scientific inquiry, in the light of the experience of other countries, as to the most economic form of transport for each class of goods.

The next step was the constitution, under the provisions of the Road & Rail Traffic Act, 1933, of the Transport Advisory Council for the advice and assistance of the Minister of Transport in developing and co-ordinating transport facilities. The council has presented a number of valuable reports to the Minister, dealing particularly with road safety measures, records to be kept in connection with the operation of road vehicles, &c., but as late as April, 1935, the Minister admitted that it had not considered the major question of the co-ordination of transport. Since the Royal Commission reported in 1930, competition between the railways and canal undertakings has been partially eliminated by the establishment of central and local committees for agreeing rates and facilities. A certain measure of co-ordination between railways and coastal liner services has also been achieved by the creation of a joint standing committee and local conferences; no working arrangement has been possible,

however, between the railways and coastal tramp owners, and, in recent years, there has been a substantial increase in coastwise carryings and a corresponding diminution in rail carryings, particularly in coal traffic.

So far as road haulage is concerned, apart from the acquisition of a number of important road carriers such as Carter Paterson & Co. Ltd., and Pickfords Limited, practically no progress has been achieved in the co-ordination of road and rail services. It is understood that last year the Chairman of the Transport Advisory Council—then Lord Goschen—proposed that the council should proceed to investigate the very difficult problem of co-ordinating goods transport by the four main competing branches of transport, and certain preliminary steps were taken. Early this year, however, Lord Goschen found it necessary to resign from his office, and the Minister of Transport appointed as his successor Sir Arthur Griffith-Boscawen, the former Chairman of the Royal Commission on Transport. The announcement made recently indicates that the Council is proceeding towards considering the problem of co-ordination by investigating services and rates for the conveyance of goods by rail, road, canal, and coastwise shipping. Not the least of their difficulties will arise from the multiplicity of the organisations which represent in some measure road haulage interests, and, having regard to the conflicting interests of the various forms of transport, it is clear that the subject will require very protracted consideration.

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The Railways of Finland

FINLAND, which occupies an area of 149,926 square miles, situated on the Gulfs of Finland and Bothnia, has existed as a separate republic only since December 6, 1917, when it declared its independence of the Russian Empire, but although it had been under Russian rule from 1809 onwards, when it was conquered by Russia from Sweden, it had retained some independence as an autonomous but not sovereign grand duchy. With the coming of the railway era, therefore, the requirements of Finland were considered separately from those of the remainder of the Russian Empire, and, when this territory became a sovereign state in 1917, it found itself possessed of a railway system much more nearly suited to its local needs than many of the independent states which resulted from the war; consequently in Finland no fundamental change has been necessary. The first step towards building a railway in Finland was taken in 1849, when a scheme was propounded for a railway with animal traction to be built between Helsinki (Helsingfors) and the Tampere-Hämeenlinna lake district. In 1851, plans were prepared for a line, between Helsinki and Hämeenlinna, to be worked either by locomotive or by horses, but the circumstances of the time were such that the scheme was not carried through. In 1856, a committee was formed by the Government to investigate the provision of communication between the lake districts in the interior of the country and the ports, as well as to give communication with the Russian capital, either by means of canals or by railways. Opinions were divided, both in the committee and the press, and there was much discussion as to which were the first lines to be built; the proposed line from Helsinki to Hämeenlinna was opposed by many who thought that a line from Turku (Abo) to Petersburg, with a branch to Helsinki, should be built first.

The partisans of the Helsinki-Hämeenlinna line won the day, and by a rescript of March 4, 1857, the Emperor and Grand Duke ordered the construction of this line at the cost of the State. This single-track railway, 67 miles long, was completed early in 1862, and on January 31 of that year the inaugural train was run. Public traffic between Helsinki and Hämeenlinna began on March 17, 1862. A two-mile branch to the port of Sornas was completed in the following year. On November 27, 1867, an Imperial rescript ordered the construction of the Riihimäki-Petersburg railway at the cost of the State, and on September 11, 1870, this line, 231 miles long, was opened to traffic. It had cost 27,525,000 Finnish marks to build, or 119,089 Finnish marks a mile. The next line, from Hanko to Hyvinkaa, was built by private enterprise and opened to traffic on October 8, 1873; it was taken over by the State in 1875. The second private line, from Kerava to Porvoo (20½ miles), was opened to traffic in 1874, and taken over by the State in 1917. The Turku-Tampere-Hämeenlinna and Tampere-Vaasa lines, both built by the State, were opened to traffic in 1876 and 1883 respectively.

Since then the system has grown up step by step, until today it includes two long south-to-north main lines, one from Kotka to Kajaani (Kajana) and the other from Helsinki to Tornea (Tornio) on the Swedish frontier, where there are transhipment facilities between the Swedish and Finnish State railways, though there is no through running owing to the gauge of the former being the standard 4 ft. 8½ in. whereas that of the latter is the Russian 5 ft. 0 in. During the war, because of the uncertainty of sea transport, this through land transport route proved of considerable value. A third longitudinal line runs from Viborg through Nurmes to Oulu, and two transverse east-to-west lines, Viborg-Riihimäki and Elisenvaara-Haapamäki connect the three longitudinals. One of the new lines referred to in our Overseas columns this week is an extension of the latter westwards to the west coast at Bjoneborg (Pori). Connection with the Soviet railways is made at Rajajoki on the Viborg-Leningrad line. Important branches, notably on the Baltic coast and along the Gulf of Bothnia, complete the main Finnish State system, which now has a route length of 5,315 km. (3,303 miles), all of the Russian 5-ft. gauge. The general layout may be seen from the map on page 698.

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New Rules for German Light Railways

THE permission granted last year to introduce higher speeds—up to 50 m.p.h.—on the German light railways, to enable them to offer more attractive services and, it is hoped, thereby improve their position, has necessitated the introduction of new operating and signalling regulations. In many cases improved signal equipment has had to be installed to permit faster trains to be run with safety. Standard rules have now been worked out in conjunction with the Ministry of Transport, based on those applying to the Reichsbahn, but necessarily less complete; the conditions are so much simpler, that about two-thirds of the main line regulations are not wanted. The new rules are classified under the headings of general operating, signalling and signal aspects, and braking. They apply to all private railways open for public traffic which have not adopted the complete Reichsbahn regulations, including not only the *Nebenbahnen*, or heavier light railways, but in most cases the *Kleinbahnen* as well. The companies are, it is stated, well satisfied with the new arrangements, which include modifications in the methods of traffic management obtaining on these secondary railway systems. During the last year or so, in an attempt to co-ordinate further the transport system of the country, the Government has passed new legislation, whereby ordinary tramways in Prussia have been grouped with bus undertakings as regards supervision and inspection, and no longer come under the light railway law.

PUBLICATIONS RECEIVED

Questions, Answers and Descriptive Diagrams of the Locomotive.—By A. E. Jennings. Dagenham, Essex: Stratford Loco. Mutual Improvement Class, 24, Joan Gardens. 7¾ in. × 4¾ in. 95 pp. Price 1s. 6d. (1s. 8d., post free).—It was our pleasure recently to review in these columns a set of questions, answers, and diagrams of the locomotive, with especial reference to G.W.R. practice, and which, by its eminently practical and easily understood treatment, could not fail to be of use and interest to all inquiring enginemen. There now comes to hand a booklet commencing on somewhat similar lines, but continuing with more especial reference to L.N.E.R. equipment, from the pen of an L.N.E.R. driver, who is also the Secretary and an instructor of the Stratford Locomotivemen's Mutual Improvement Class. The subjects here treated, given in a booklet of handy size for carrying about in the pocket or bag, cover hot-water injectors, steam brake valves, vacuum ejectors and lubricators, in addition to many questions and answers on valves and pistons and on failures. Altogether, this forms a useful semi-technical work that is available at a very low price, and will be found of interest to all concerned with locomotive running and to the inquiring outsider also.

Training in Industry. Edited by R. W. Ferguson. London: Sir Isaac Pitman & Sons Ltd., Parker Street, W.C.2. 8¾ in. × 5½ in. × ¾ in. 156 pp. Price 6s. net.—In recent years a beneficial co-operation between educationalists and employers has been achieved through the activities of the Headmaster's Conference and other similar bodies. However, there still seems to be uncertainty in the public mind as to the requirements of the various branches of commerce and engineering. We in this office, for instance, receive frequent inquiries for advice on such matters in relation to the railway and allied industries. So often entry into industry, although of vital importance to the individual concerned, is a haphazard procedure dependent principally on chance. The applicant having the necessary qualification for some opening that presents itself—and qualifications in these days of standardised school education are of a uniform kind for almost all branches of both commerce and industry—may think that sufficient, and quite overlook any question of suitability for the particular sort of training that may follow. No doubt financial considerations have tended to accentuate this in recent years. Nevertheless this report, which embodies the results of inquiries conducted between 1931 and 1934 by the Association for Education in Industry and Commerce, should be a valuable guide to warn against such "blind" procedure. Typical examples of training schemes, those of three British railways and various engineering firms among them, are analysed and discussed, and in an appendix some of these are set out in full. This treatment should facilitate the attempt to match temperament with environment before the decisive plunge is taken. Lord Leverhulme contributes a foreword.

Juridical and Administrative Systems in Force on the Frontier Sections of Railway Lines and at Junction Stations. Geneva: League of Nations. London: Allen & Unwin Limited, 40, Museum Street, W.C.1. 9½ in. × 6¼ in. 160 pp. Price 3s. net.—From the early days of railway development on the European continent the necessity arose of constructing railways crossing international frontiers in order to provide through facilities. In order to avoid trans-shipment of goods and exchange of passengers the system was therefore evolved of establishing exchange stations where customs examination might be made by the two governments involved. Broadly speaking, these stations have taken one of two forms, either a station belonging to each administration on its own side of the frontier, or a common frontier station where facilities are provided for the customs service of both governments. In the present League of Nations report, the Organisation for Communications and Transit has presented a valuable summary of the development of existing arrangements as exemplified by conventions and treaties over a period of 85 years. The first referred to is that made on December 31, 1850, between the Imperial Austrian Government and the Royal Government of Saxony, and the most recent that of August 1, 1934, between the P.L.M. and the Italian State Railways for the operation of the section of railway from Modane to the frontier, and the joint use of Modane station.

So far as new construction is concerned, the report embodied in this volume recommends the adoption where possible of a single common station so as to offer every facility to the public and to enable the railways to be operated as simply and economically as possible. Full consideration is given to the rights and privileges of the "foreign" staff performing their duties outside their own frontiers, and to such matters as the exemption from customs duty of certain consignments sent to them. The second part of this work constitutes an important source of reference, for it is a study by the Secretariat of the League of Nations Organisation for Communications and Transit on the whole problem of administrative liaison between railway systems whose lines join at a frontier. Such subjects are covered as the separation of state railway employees considered as servants of a transport undertaking from those other servants of the state who are concerned purely with functions of government. It then deals with the arrangement of train services; railway police; timetables; tariffs; the language question; and the status of frontier sections in the event of a change of sovereignty. A useful appendix is a chronological index of the paragraphs of various conventions and treaties referred to in the text.

The Caprotti Valve Gear Handbook for Shed and Running Staffs.—Caprotti Valve Gears Limited has issued a new handbook specially written for the guidance of fitters and others employed in locomotive running shed staffs. This handbook is fully illustrated with drawings and photographs, and completely elucidates all the points associated with the Caprotti valve gear for locomotives and its repair, adjustment and general maintenance. It is invaluable as a work of reference and seems to us to clear up all points that are likely to arise in connection with the use and upkeep of the gear. Many Caprotti-fitted locomotives of different countries are illustrated, but the main value of the illustrated portions of the handbook lies in the copious and clearly explained drawings showing the construction of the gear and the manner in which it operates. Those responsible for obtaining the best results from the Caprotti gear in service have here a very handy means of keeping themselves acquainted with the simplest ways of maintaining it in proper condition. Clear printing and well-produced illustrations go a long way towards enhancing the value of the publication, which is of convenient dimensions, with semi-stiff covers.

Equipment for Passenger Vehicles.—The form of seating required for railcars is sufficiently different from the standardised type of railway carriage accommodation for its design to afford opportunities of eliminating some old-established drawbacks of the ordinary carriage seat. An illustrated catalogue which we have received from G. D. Peters & Co. Ltd., Windsor Works, Slough, shows many examples of seats for railcars and public road service vehicles in which a modern appearance has been combined with comfort of upholstery and shaping. Reversible and revolving seats are among the types listed, and are distinguished by the characteristics of light weight and sturdy construction combined in their mechanisms. Whereas both the foregoing examples are also applicable to tramcars and trolleybuses, one pattern of seat is made specifically for railcar use. In this, special attention has been paid to the contours of the backrest in order to provide that support without which the best upholstery is no safeguard against weariness. The generous dimensions of the seat are a further guarantee against discomfort on long journeys. Various types of semi-luxury and luxury seats are supplied for motor-coach use on medium and long-distance service. All seats are mounted on light but very strong aluminium alloy pedestals which are available in a variety of standard shapes for different requirements.

THE SCRAP HEAP

The Chief Operating Manager's Department of the L.M.S.R. employs 7,700 horses for cartage and other purposes.

* * *

A wealthy American 42 years ago bought an inclusive ticket for a European tour from the New York office of Thomas Cook & Son. The ticket was never used, and the owner is now dead. His daughter has handed it back, asking for a refund. Some of the railways, steamship lines, and hotels for which the ticket was valid do not exist, and not a single currency involved in the projected tour now holds the same value.

* * *

The driver who took the first locomotive from England to Prince Edward Island in 1871 is still hale and hearty despite his 81 years. He is Peter Oliver, now on the retired list. The railway on Prince Edward Island was begun as a local government project, Prince Edward Island at that time not having joined Confederation. Two years later Prince Edward Island entered the Canadian Confederation; the railway was taken over by the Dominion Government, and became known as the Prince Edward Island Railway. It was placed under the jurisdiction of Intercolonial Railway officials for operation.

* * *

Mr. Nabie Abraham, of West Africa, recently wrote to B.E.N. Patents Limited as follows:—

Dear Sir,—

Upon perusing a certain paper, your esteemed name and address became known to me, that you are the best, famous and first to none manufacturer in that City Circle.

As regards to such recommendations, I have been no doubt inspired to ask you very earnestly to forward me one of your newly but modest catalogues for this current year 1936.

Receiving this in a due course, I will also lose no time to go through it, and make my best and fashionable selections.

After this selection, I am cock-sure to deal with you on large scales.

Hoping that this my initial but prompt letter will undoubtedly meet you at your best opportunity in this new Leap Year; and also expecting the said catalogue in anticipation.

I remain,

Your Obediently,

N. Abraham

* * *

THE FELINE BRADSHAW

I have word today of a Cheshire cat rather more remarkable than the one which Alice met. Ginger by name, a wanderer by nature, his headquarters are the railway station at Stalybridge. Every day he takes the train to Stockport and back dining *en route* in the kitchen car. No one assists him; he just boards the train without any fuss and catches the right train home. And if you think that that sounds rather unlikely, let me tell you that it is nothing to what, I am assured, this cat does on occasions. For sometimes he makes longer excursions. He has been, by train, to London, to Leeds, and to Cardiff among other places; and he always gets home again, boarding the right train by some uncanny instinct denied to mankind. How he must have despised that cat that got into the newspapers last year for making a 200-mile journey—on foot!—*From the "Yorkshire Post."*

LIES & MANCHEATER RAILWAY.

Know all Men by these Presents,

That We, the Directors of the above Railway, incorporated by virtue and in pursuance of an Act of Humbug, made and passed by ourselves, being enemies of all and all manner of monopoly except our own, and being moreover exceedingly anxious to forward the general well-being of society, so far as is consistent with our own interests, and viewing with a virtuous indignation the attempts of certain individuals to obtain an honest livelihood and serve the public, contrary to our known and often declared wishes and interests;—do hereby publish and offer the following striking advantages to commercial men and others, who travel by our magnificent and splendid Railway:—

FIRST.—We intend to continue (as far as in our power,) our customary and well-known inattention and incivility to all passengers, by encouraging those servants who are most noted for rude and uncivil conduct, and by all other means, thereby shewing our immense superiority to, and contempt for all mankind.

SECOND.—We have resolved, in consequence of the above-mentioned base and insidious attempts, to lower our Fares, till we have reduced the impertinent upstarts, who are the authors of this opposition to our will and pleasure, to their original insignificance, when we shall immediately raise our charges again as high as is allowed by our above named Act of Humbug. We trust that the intelligent public will fully understand this, and duly appreciate our motives for this present proceeding.

THIRD.—We promise to increase our speed of travelling, so that the above parties, who have presumed to run Coaches in opposition to our Railway, (disregarding our known wishes on the subject,) may perform the journey in not more than a quarter of an hour shorter time than we or our agents. But as this will augment the danger, and increase the number of casualties, we have arranged,

FOURTH.—That cemeteries shall be immediately erected at each Station, and plans of such cemeteries deposited for passengers previously to startling, to book a place in, by payment of a small charge, so that when the accidents happen, there will be no confusion or unpleasantness in the arrangement or burial of the bodies. A dissecting room will be attached. Our fees for maiming and killing are as follow:—

For One Arm....2d.	**For One Leg....3d.**	**For Three Ribs.....6d.**
For Two do. ....4d.	**For Two do.....6d.**	**For Six do. .... 1s.**

And so on in the same proportion.

For Killing One outright ..... 2s. 6d.
For Killing Two do. ....7s. 6d.

And similarly in proportion.

FIFTH.—We particularly recommend our Third Class Carriages to the attention of the public, as we know of nothing so certain to give colds and consequent consumption: and it is a known fact of the present day, that the chief source of all our national distress is that the consumption is not equal to the supply. Of the base calumny circulated by the opposition party that pigs, &c., generally travel in the same carriages, we disdain to take any notice.

Finally, we beg to present to the travelling public, a short summary of the peculiar comforts and enjoyments in which, on this Railway pre-eminently above all others, the passenger may luxuriate. We would point attention to our new Patent Breaks, attached to our Third Class Carriages, which it can be proved will exceed in noise and stench all nuisances yet invented or known:—also to the ingenious axle-trees lately added to our Second and Third Class Carriages, whereby the excruciated passenger may revel in the delights of a transition from them to the First Class Carriages, with great benefit to our exchequer. We would also dwell upon the advantages we possess above all other Railways and Roads, in our long and frequent stoppages at road side stations, which enable our wearied passengers, stiff and sore from the rough exercise, to take a quarter of an hour's gentle airing. Moreover, adventurous admirers of the picturesque will be afforded the opportunity of witnessing a tunnel in its last convulsions, and of conjecturing in breathless awe the probability of its falling upon his own or the next successive train. Plethoric passengers will also find great advantages from the shortness of the stoppages at the feeding or rather exercising stations. In short, the hard and dirty stuffing of the First Class Carriages, the coldness and discomfort of the Second Class, and the disgusting filthiness of the Third Class Carriages or Pig-Pens, as some one has facetiously called them, we will guarantee to be unequalled in any other mode of conveyance, whether by Rail, Coach, or Stage Waggon, be the same British or Foreign.

N.B. The reasonableness of the Fares may be illustrated by the fact, that Passengers may be taken to Leeds at the prodigiously low rate of 2s. 6d. each, and to Normanton, only half the distance, at the proportionably still lower rate of 3s. 9d.

Offering such advantages, the Public cannot fail fully to appreciate the disinterested motives, and unceasing attention of us, the Board of Directors of the LIES & MANCHEATER RAILWAY.

Signed on behalf of the Company,

JOHN LAWLESS,

CAPTAIN IN THE HORSE MARINES.

Placing Offices. Grasp Hall, May 18. 1843.

An anti-railway relic of 1843. *The original issued by the stage coach proprietors in opposition to the Leeds & Manchester Railway was stripped off a wall at Huddersfield by Mr. Philip Wood, the first Agent of the railway*

OVERSEAS RAILWAY AFFAIRS

(From our special correspondents)

SOUTH AFRICA

Estimates of Additional Expenditure

The estimates of additional expenditure from revenue funds and on capital and betterment works have been tabled by the Minister of Railways. At the end of the financial year there will be a surplus of about £3,500,000 for disposal, of which £500,000 will be spent on the elimination of level crossings, £2,000,000 will be allotted to the Renewals Fund, and £1,000,000 towards the reduction of branch line capital. The £2,000,000 Renewals Fund payment is the replacement of an amount utilised from that fund in the 1922 depression. The reduction of branch line capital by £1,000,000 will result in an immediate saving of £35,000 per annum in interest charges. The ultimate aim of the Minister is that there shall be no " dead " capital in railway accounts, which in branch line capital amounts to no less than £14,000,000.

Capital Represented by Abandoned Sections of Line

The extent to which capital is represented by abandoned sections of main line where deviations have been constructed and by tunnels which have been abandoned, as well as disused works of all kinds, is to be ascertained.

The estimates of additional expenditure on capital and betterment works for the year ending March 31 amount to £232,121, bringing the total for the year up to £4,898,264. The additions include £12,232 for the Springs-Nigel line, £15,449 for the Durban-Point-Congella line, and £75,164 for the acquisition of the Postmasburg-Beeshoek private line and the construction of the line from Beeshoek to Lohathla and Kapstewel. Road motor services will absorb £186,238 and unforeseen works £40,000.

The estimates of additional expenditure for revenue funds total £4,690,007, made up of transportation services £784,740, subsidiary services £75,719, expenditure on net revenue account £69,943, level crossings £500,000, reduction of branch line capital £1,000,000, Renewals Fund £2,000,000, and responsibility allowance £180,000.

South African Airways: Three New Machines

Three more aeroplanes have been ordered from the Junkers Company for the South African Airways (S.A.R. & H.). The machines are to be fitted with Rolls-Royce Kestrel XVI engines of 740 h.p. They are stated to have a maximum speed at sea level of 199 m.p.h., 215 m.p.h. at 6,000 ft., and 239 m.p.h. at 14,500 ft. The cruising speed at sea level is claimed to be 189 m.p.h. They have accommodation for ten passengers and a crew of two, and their range with a full complement of passengers and mail is said to be 665 miles. Exclusive of wireless equipment, which will be supplied by the Marconi Company, the cost of the machines is £24,500 each.

System Engineers' Annual Meeting

In opening this meeting at headquarters on February 12, Mr. A. G. Watson, the retiring Assistant General Manager (Technical), S.A.R. & H., referred to the improved track maintenance that had made possible the running of better engines and rolling stock. He asked the engineers present, however, to aim at a standard of maintenance, suitable not only for 55 m.p.h., but even faster speeds, for which there was an ever-increasing demand that must be met. Mr. Moyers, Chief Civil Engineer, subsequently took the chair.

One of the most important items on the agenda of the meeting was the application of welding to trackwork. Distinct progress was reported as having been made with joint welding, and a very fair measure of success obtained. On the Tuinplaats-Marble Hall line, for instance, which consisted entirely of short lengths of rail welded together, no failure of joints had recently been reported. The discussion also covered repairs to crossings by welding.

Another item was the advisability of issuing definite programmes of instructions to maintenance gangs. A trial of such a scheme on the Cape Northern System appeared to be successful, and after considerable discussion the meeting in general favoured its further pursuance. Among other items discussed were: the interests of the lower-graded staff; the national question of erosion; the movement of departmental traffic as far as possible in slack traffic periods; domestic water supplies, sanitation, rodent-proofing and the housing of staff; to mention but a few of the 69 in all.

FRANCE

Etat Suburban Electrification Services

It was the completion of the quadrupling between Bois-Colombes and Le Stade that made possible the recent inauguration of the electric services between Paris and Argenteuil, recorded in the *Electric Traction Supplement* of February 7. Though the electric trains have a smaller seating capacity than the steam (981 as against 1,812 seats), a more frequent service is now possible in the busiest hours, with an increase in the total number of passengers carried an hour. In the rush hours there are now 16 trains in each direction an hour, including two steam trains to or from Conflans.

The time taken from Paris to Argenteuil, formerly 19 min., is now 12 min. by the non-stop and 15 min. by the semi-fast trains. It has been possible to reduce the size of the trains travelling beyond Argenteuil, and to increase their frequency, as many passengers have been transferred to the electric trains. There are at present 47 trains daily on the Argenteuil-Conflans section, instead of 24 terminating at Conflans and 27 at Cormeilles. The Paris-Mantes service now has 17 trains daily instead of 13; they are formed of eight 154-tonne 4-coach sets, in place of the heavy sets weighing 231 to 400 tonnes. The daily tonne-kilometres have fallen from 748,000 to about 635,000. When the main line services are altered on May 15, further improvements will be possible.

INDIA

New Construction Budgeted for in 1936-37

During 1936-37 a total provision of only Rs. 23·65 lakhs has been allowed for new construction on all railways, out of which Rs. 22 lakhs are for the Megna Bridge on the Assam-Bengal Railway. This bridge, which will replace the existing wagon ferry, is considered to be of vital importance as a means of through communication between Assam and Eastern Bengal.

Open Line Works in 1936-37: E.I.R.

On the East Indian Railway, the total net expenditure from Capital and Depreciation Fund on open line works during 1936-37 is estimated at Rs. 193·39 lakhs, inclusive of expenditure for the restoration of earthquake damages. The rolling stock programme involves an expenditure on capital account of Rs. 34·10 lakhs in addition to Rs. 19·1 lakhs from the Depreciation Fund. The programme is mainly one of betterments, the additions being 30 lower class, luggage and brake bogies, 30 TO. type tank wagons for kerosine oil traffic, and 25 O. type wagons. Track renewals will absorb about Rs. 92·82 lakhs, mostly from the Depreciation Fund. The strengthening and regirdering of bridges will be continued, and involves a sum of Rs. 2·59 lakhs for the completion of the Chandmari road overbridge at Howrah and Rs. 80,000 for the regirdering of the Dufferin Bridge (7 spans of 333 ft. and 18 spans of 50 ft.) over the Ganges between Moghalserai and Benares. The coming year is likely to see the completion of the remodelling of the Jamalpur workshops, for which a sum of Rs. 10 lakhs is provided: an additional provision of about Rs. 3·70 lakhs is also made for the replacement of machinery and plant there. An additional erecting shop bay is to be

built at Lucknow at a cost of about Rs. 6·75 lakhs, and work will be continued on the Cawnpore-Tundla doubling. The remodelling of five more stations in connection with this scheme has already begun.

Bengal-Nagpur Railway

A net sum of Rs. 109·50 lakhs is provided for open line works on the Bengal Nagpur Railway during 1936-37. The rolling stock programme, involving a capital expenditure of Rs. 4·51 lakhs and an expenditure of Rs. 23·58 lakhs from the Depreciation Fund, is wholly one of betterments, no additions to the stock being made during the next year. A sum of Rs. 46·73 lakhs is provided for expenditure on track renewals, the bulk of the money coming from the Depreciation Fund. Funds are allotted for the continuance of engineering and structural works already in progress, and a sum of Rs. 9·5 lakhs is provided to complete the modernisation of the electricity generating plant at the Kharagpur workshops.

Eastern Bengal Railway

On the Eastern Bengal Railway net expenditure on open line works during the year 1936-37 is estimated at Rs. 75·07 lakhs. Under rolling stock Rs. 18·50 lakhs is to be spent from capital and Rs. 22·21 lakhs from the Depreciation Fund. Rs. 28·68 lakhs will be spent from the Depreciation Fund on track renewals. The allotment for bridge works amounts to Rs. 10·70 lakhs for the regirdering of the Gorai Bridge, in addition to over Rs. 3 lakhs for the completion of the Hardinge Bridge protection and training works.

FINLAND

New Constructions in Hand

The State Railways administration has at present under construction four new lines of railway—one of these, the Kontiomäki-Taivalkoski, has only recently been started, but its estimated cost is over Fmk. 169 millions, or £744,500. The following table shows the other three lines and some details of them:—

	Length of Line (Miles) Still to be Completed	Estimated to Cost (£)
(i) Björneborg-Haapamäki ...	58	370,000
(ii) Varkaus-Viinijärvi ...	12½	376,000
(iii) Vuoksenniska-Elisenvaara ...	15½	174,000

Of these (ii) and (iii) are expected to be completed this year, but not (i), which is a long and important trunk line connecting the port of Björneborg with Haapamäki, a junction on the existing Helsinki (Helsingfors)-Oulu-Tornio main line, and junction for another line running eastwards to Jyväskyla, Pieksämäki and Savonlinna. The new line will thus give the latter towns and all traffic via Haapamäki a direct outlet to the western seaboard.

Locomotives & Rolling Stock on Order

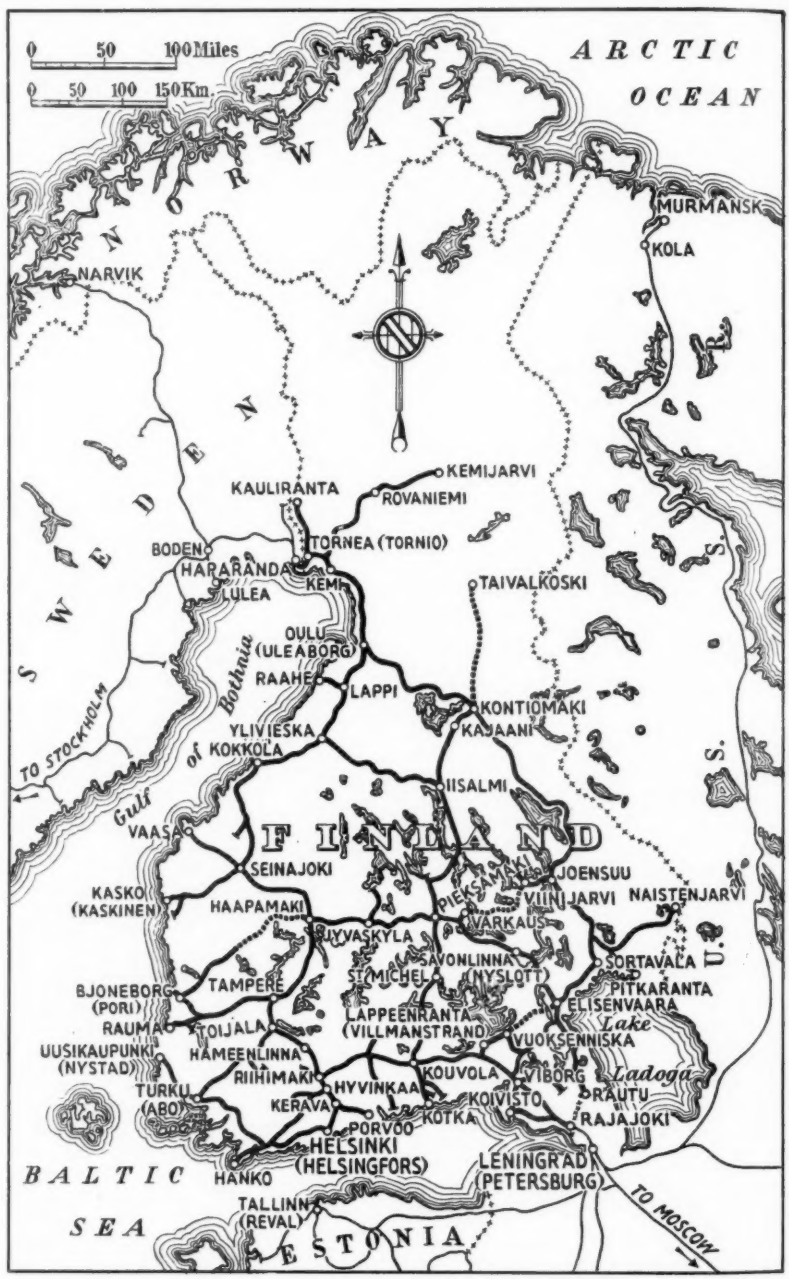
Appropriations are made for the following items in the 1936 Budget:—

	Fmk.
8 freight locomotives	7,450,000
2 express passenger locomotives	1,300,000
5 third class coaches	1,500,000
3 second and third cl. sleeping cars	1,320,000
300 open goods vehicles	10,500,000

All ten locomotives will be built in Finland, and the figures given represent only the payments to be made towards their total costs in the current year. The passenger engines will weigh 110 tons and be of a heavier and more modern type than any at present running. In spite of the fact that 400 new wagons were ordered in 1935, the growing volume of traffic necessitates the further 300 being ordered this year.

Finance and Traffic

The year 1934—the last for which complete figures are available—was the



Sketch map showing the new Finnish railways under construction and the State Railways system generally referred to in our editorial on page 694

best from the financial point of view the State Railways have had since 1928. The following table gives some idea of the recent fluctuations in receipts and expenditure (all figures are in millions of Fmk.):—

Year.	Gross Revenue	Ordinary Expenditure	Surplus or Deficit
1930	789·7	724·9	+ 64·8
1931	693·5	669·0	+ 24·5
1932	677·1	682·1	— 5·0
1933	725·8	655·0	+ 70·8
1934	829·5	673·8	+155·7

It will be noticed that though gross revenue was 14·3 per cent. higher in 1934 than in 1933, expenditure was only 2·9 per cent. higher. During the period January-August (inclusive), 1935, gross revenue was 12·1 million and expenditure 28·3 million Fmk. higher than in the corresponding period of 1934. The number of passengers carried has remained practically stationary since 1932, but goods traffic had increased by 43 per cent. by 1934. The majority of the 60,000 tons of steam coal required for these railways is imported from the United Kingdom, but, even in point of value, the quantity of wood burnt is over four times that of coal, according to the 1935 Report of the Department of Overseas Trade upon "Economic Conditions in Finland."

[An editorial describing the growth of the State Railways system is published on page 694.]

DENMARK

Snow-Storm Losses

During the last week of February a heavy snowfall combined with an unusually prolonged south-easterly gale caused serious difficulties over the whole of Denmark. Many main roads were completely blocked for several days, the main-line railways were all seriously disorganised, and nearly all branch lines had to be closed altogether. This snowstorm cost the Danish State Railways Kr. 400,000 besides loss of traffic, although this was not so great as might have been expected because the roads were absolutely closed in many places.

Important Works Delayed

The rebuilding of the Masnedsund bridge [referred to in our issue of January 17.—Ed. R.G.] is now in hand as a temporary measure, the original single girder span being replaced by several short spans from stock, supported on temporary piers. Work on this job as well as on the Storstrøm bridge is at present at a standstill in consequence of the extensive lock-out and strike which have now been in force for over a month. This will also interfere with the completion of the eight new aluminium-alloy trailer coaches for the Copenhagen electrified services. These coaches will be necessary after the opening of the electric services to Holte, as the maximum train-length is then to be increased from six to eight coaches. The new trailers will weigh only 26 tons against the 38 tons of the steel coaches, so that the acceleration of the trains will remain practically the same although the seating capacity is increased nearly 35 per cent. Trial running on the Hellerup-Holte line began on February 22, and the substation at Holte is practically completed.

Reduced Speeds due to Permanent Way Overhaul: New Spur Line

Considerable slowing-down of most steam-worked main line express trains will take place from the introduction of the summer timetables on May 15, occasioned by the extensive permanent way improvements taking place on most of the Danish main lines at the moment. The schedules of the Lyntog will not be affected because of the considerably higher acceleration of these trains, which enables them to pick up speed much more quickly after permanent way slacks.

An important piece of work at present in hand is the construction of a new double-track connection from Svendstrup to the east end of the station at Randers; when this is completed, the present reversal of all trains at Randers will be obviated.

Through Service via Jutland

In the article published in The Railway Gazette of February 28, entitled "Improving Communications between Germany and Scandinavia" the new route to Norway via Jutland is mentioned. This is to be opened next year and will make use of the new harbour, Hirtshals, 10 miles north of Hjørring. Coming southwards, the route from Hirtshals is via Aalborg, Aarhus and Fredericia to Padborg on the German frontier, and from there on to Rendsburg and Hamburg. At the moment of writing it seems probable that this service, which will connect with a new steamer service from Kristianssand in southern Norway, will be worked by fast diesel trains consisting of one motorcoach and one trailer, and that these units will be combined with those to and from Frederikshavn to form multiple-unit trains between Hjørring and Hamburg, the Danish drivers working through to Hamburg accompanied by a German pilotman. These trains will work to high-speed schedules, and the new route will become far the quickest one between Norway and Germany.

BRAZIL

New Rail Connection between Uruguay and Brazil

The line from Treinta y Tres, on the Central Uruguay Railway, to Rio Branco, on the Uruguayan side of the frontier, and thence by means of the international bridge to Jaguarão, on the Brazilian side, was recently opened to traffic.

Eastern Railways of Brazil

Work upon the extension beyond Contendas, which had been suspended temporarily, has now been resumed under the supervision of Snr. Theogenes Rocha, Chief of Construction. This line is to be extended to Palmeiras, and thence to the bank of the Rio das Contas.

As regards the dispute which arose over the rescission of the contract between the Federal Government and the Cie. des Chemins de Fer Fédéraux de l'Est Brésilien for the operation of this railway system, the finding of the Federal Justices in Bahia, who ordered the immediate restoration of the railway and effects to the concessionary company, has now been definitely quashed by the Supreme Court.

Paraná Railway

The Federal Government has approved the construction of a deviation extending from Km. 23·145 to Km. 29·458 on the Rio Negro branch of the above system, at an estimated cost of 1,170 contos: the major portion of this sum will be met from the 10 per cent. tax for improvements.

EGYPT

Mersa-Matruh Extension

On March 17 this extension was opened for passenger traffic, including the bringing into use of Jerwala station at km. 283·2 and the temporary terminus at km. 299. The terminus proper at km. 302·25 was brought into use on April 1. [It may be recalled that we recorded the completion of the line on March 15 in our news columns of March 20.—Ed *R.G.*]

Serious Level Crossing Accident

A serious collision occurred on the level crossing at km. 24·7 between Berkash and Zat El-Kom halt at about 23.40 hours on March 19, when a loaded ballast train from the direction of Khatatba came into collision with a lorry loaded with 43 labourers. Nine labourers were killed on the spot, 16 received serious injuries, of whom one died on admission to hospital, and 18 others sustained minor injuries. The level crossing is guarded between sunrise and one hour after sunset, but is left open and unguarded by night. Warning boards bearing the inscription "Beware of Trains" are, however, erected on both sides of the crossing. According to Ministerial Decree all vehicles before passing over a railway line must come to a dead stand, and the driver must satisfy himself that no train is approaching before passing over the line. The driver of the motor lorry, who was not fatally injured has been arrested by the Parquet.

Model of Level Crossing Automatic Barriers

Zaki Eff. Tadros, of the E.S.R. Way and Works Department, is exhibiting at the Exhibition of Agriculture and Industry a model of an automatically operated pair of level crossing barriers invented by him.

NICKEL STEELS IN RAILWAY ENGINEERING—I

By L. W. JOHNSON, M.Met.

ALTHOUGH wrought iron and, subsequently, carbon steel have in the past played their part in the realm of railway engineering, and are still doing so, the intense competition which this particular industry has had to face in recent years has necessitated the use of higher tensile alloy steels in order that better performance can be achieved. It may be of interest to discuss briefly the effect of nickel, and also various other alloying elements which are often associated with it, on the properties of steel.

Effects of Nickel

Mild steel is a ductile, tough material possessing a relatively low tensile strength. If it is necessary to increase its strength the simplest method is to add carbon, which is both cheap and efficacious. Certain drawbacks, however, arise from the addition of carbon, for, while the tensile strength or hardness is increased, there is a corresponding reduction in the ductility and toughness, so that in the higher carbon ranges it will be found that a moderately high tensile strength is associated with inferior toughness and, in certain cases, brittleness. It is in such circumstances that nickel is beneficial because when added to steel it simultaneously refines, strengthens, and toughens the iron or ferrite constituent, in which it is entirely dissolved. It will be found, therefore, that a nickel steel, compared with a corresponding carbon steel, will always be tougher for the same tensile strength, or, alternatively, for the same toughness will be found to be stronger. This difference is further accentuated by heat-treatment as will be seen from Table I, due to Brearley. Here is shown the effect of hardening and tempering two steels identical in chemical composition with the exception of the nickel content, so that they possessed the same tensile strength. The difference in the toughness is clearly demonstrated by the impact test figures obtained.

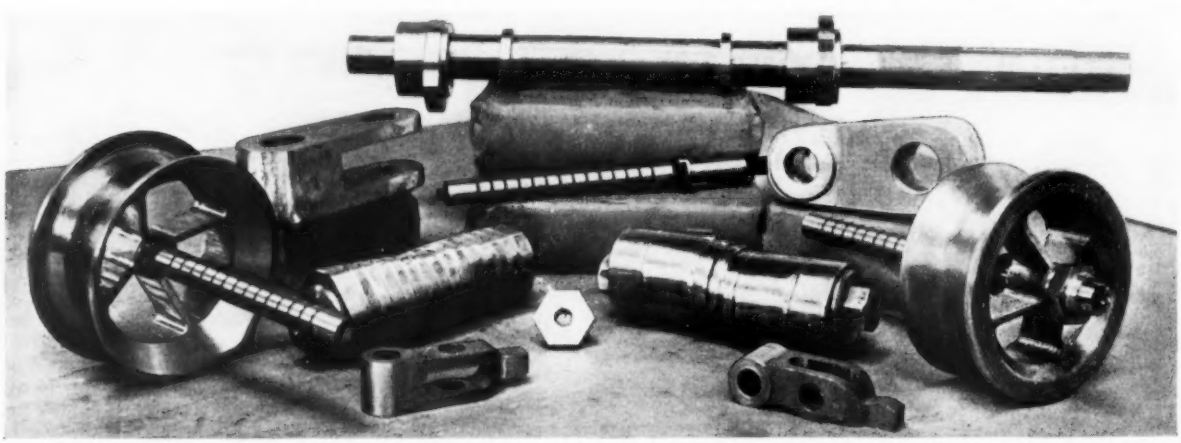
TABLE I.—MECHANICAL PROPERTIES OF A NICKEL STEEL AND A PLAIN CARBON STEEL HEAT-TREATED TO GIVE THE SAME MAXIMUM STRESS

	Carbon steel	Nickel steel
Chemical composition per cent. :		
Carbon	0·33	0·33
Silicon	0·15	0·13
Manganese	0·63	0·63
Nickel	—	3·28
Mechanical properties, hardened and tempered :		
Yield point, tons per sq. in.	—	43·2
Maximum stress, tons per sq. in.	52·8	52·9
Elongation, per cent.	16·0	25·0
Reduction of area, per cent.	43·2	64·9
Izod impact, ft.-lb.	10, 11	100, 104

It is well known that in order to harden steel it is necessary to cool it at a rate which is greater than the rate at which transformation from one state to another takes place at the hardening temperature. In the case of carbon steels, this transformation occurs very rapidly, and consequently drastic quenching has to be employed. This obviously favours the setting up of high internal stress, with the consequent danger of the formation of cracks and the production of distortion. Moreover it will also be clear that, owing to the relatively low thermal conductivity of steel, in the case of large sections the rate of cooling from the outside to the centre will progressively decrease, so that in the internal portions the beneficial effect of heat-treatment will not be realised. In actual practice in the case of ordinary carbon steels, the beneficial effect will be found to be produced right to the centre of bars only of about $1\frac{1}{8}$ in. diameter and less. This failure to obtain full quenching right through to the centre of large sections is known as " mass effect."

Nickel, either alone or in association with other elements such as chromium or molybdenum, has been found beneficial in this respect, because nickel has the important advantage that it not only lowers the temperature at which transformation takes place, but also renders the rate of change much slower, so that a less drastic quenching medium, such as oil, can be substituted for water. By increasing the amounts of the alloying elements, the rate can be further slowed down so that hardening in air will be found sufficient. This means that besides eliminating " mass effect," the use of nickel also makes possible the elimination of cracking and distortion.

Nickel also has the capacity for restraining grain growth



Steam and exhaust cams, levers and gears in the R.C. poppet valve equipment of the L.N.E.R. " Hunt " class locomotives are made of nickel-chromium case-hardening steel

during heating, which, in the case of carbon steels, is sufficiently excessive to result in embrittlement of the steel. The restraining influence of nickel means that a wider latitude of quenching temperature can be allowed without the risk of a variation in properties, especially important in the case of large forgings, where it may be difficult to ensure an absolutely even temperature over the whole of a rather large furnace. The same effect is also of importance in connection with case-hardening steels, as the employment of a 3 per cent. nickel steel enables the two water-quenches from 900° C. and 780° C., necessary for carbon steel, to be replaced by a single oil quench from 760° C.

Range of Nickel Steels

Nickel, either alone or in conjunction with chromium and molybdenum, produces a range of steels which have an exceptionally wide application and will provide tensile strengths up to 120 tons per sq. in. and over, accompanied by good toughness and ductility. It will also provide case-hardening steels having core strengths as high as 90 tons per sq. in. again coupled with good toughness.

Whilst the 3 per cent. nickel steel is the most extensively used of alloy steels, because of its excellent all-round properties, nickel in lower percentages is also beneficial for certain purposes. For instance the 0·4 per cent. carbon steel, when used in either the normalised or hardened and tempered condition, has been found to give rather variable Izod values, and the addition of about 1 per cent. of nickel was found to produce consistency, not only in the impact value, but also in the yield point. The addition of from ½ to 1 per cent. of nickel has also been found advantageous in a similar manner in the case of certain semi-alloy steels when they are used in large sections.

A further use of nickel has been discovered as a result of research in connection with copper constructional steels. The presence of copper, especially when greater than about 0·5 per cent., may result in surface cracking during hot working, but this can be prevented by the addition of small amounts of nickel (at least a half that of the copper content is recommended).

Boilers

The present tendency towards the use of higher boiler pressures has caused the designer to look for other steels than the mild steel boiler plate, since it is not always possible to permit the extra weight which would be entailed if ordinary steel were used. For this reason the Canadian

TABLE II.—L.M.S.R. SPECIFICATION FOR ACID NICKEL-STEEL BOILER PLATES

Chemical Composition :	Per cent.
Carbon	0·20 to 0·25
Silicon	0·10 ,, 0·15
Manganese	0·5 ,, 0·7
Sulphur	0·04
Phosphorus	0·04
Nickel	1·75 to 2·0

Mechanical properties :	
Maximum stress, tons per sq. in.	34 to 38
Yield point, per cent. of M.S.	50
Elongation, per cent.	22 to 24
Reduction of area, per cent.	50

Bend test : Bent 180 deg. round a pin twice the thickness of the plate

Physical properties obtained on cross-test of ⅞-in. plate :	A	B
Yield point, tons per sq. in.	21·5	22·2
Maximum stress, tons per sq. in.	34·4	35·2
Elongation, per cent. on 8 in.	21·5	22·2
Reduction of area, per cent.	54·0	53·0

TABLE III.—PROPERTIES OF ACID NICKEL STEEL FIREBOX PLATES

Specified physical properties :

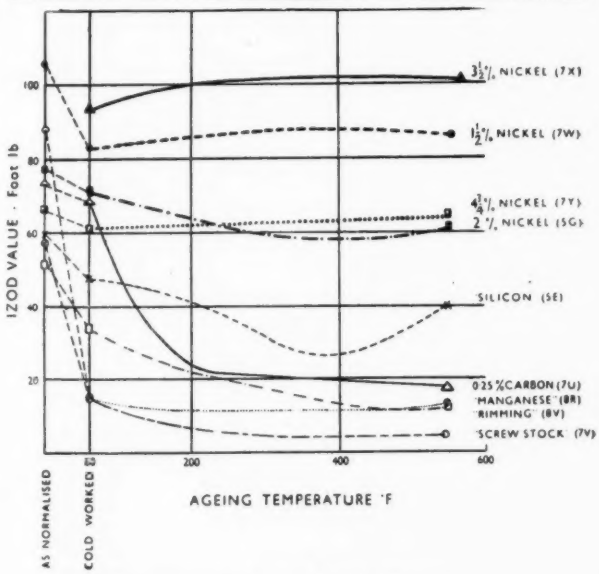
Maximum stress, tons per sq. in., min.	29
Yield point, per cent. of M.S.	50
Elongation, per cent. on 8 in., min.	20
Reduction of area, per cent.	50

Bend test : Bent 180 deg. round a pin twice the thickness of the plate

Physical properties obtained :	⅜-in. plate	½-in. plate
Yield point, tons per sq. in.	20·3	18·4
Maximum stress, tons per sq. in.	30·3	30·0
Elongation, per cent. on 8 in.	27·0	30·0
Reduction of area, per cent.	59·5	61·4

TABLE IV.—TYPICAL TESTS OF NICKEL-STEEL BOILER PLATES

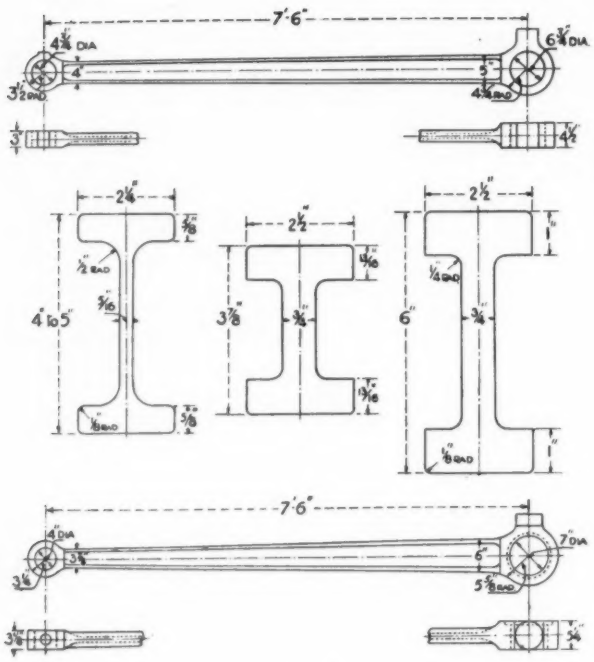
	G.W.R.	Bengal–Nagpur Railway
	Per cent.	Per cent.
Carbon	0·32	0·26
Silicon	0·078	—
Manganese	0·75	0·78
Sulphur	0·027	0·04
Phosphorus	0·028	0·03
Nickel	1·99	2·03
Normalised at 900° C. :		
Maximum stress, tons per sq. in.	36·3 to 40·0	36·0 to 39·4
Elongation, per cent. on 8 in.	19·5 ,, 22·0	22 ,, 25



Effect of "ageing" on the impact values of carbon and nickel steels. Steels stretched 5 per cent. at atmospheric temperatures and then reheated for one hour at specified temperatures. Note position of nickel steels at top of chart

COMPOSITIONS OF THE STEELS TESTED

Lot No.	Chemical composition, per cent.						
	C	Mn	Si	P	S	Ni	Al
7V	0·13	0·64	0·07	0·091	0·129	—	—
7U	0·25	0·38	0·11	0·010	0·031	—	—
8V	0·22	0·34	0·01	0·015	0·025	—	0·007
5E	0·27	0·62	0·20	0·027	0·040	—	0·009
8R	0·26	0·85	0·24	0·032	0·039	—	0·009
7W	0·16	0·44	0·22	0·010	0·029	1·44	0·009
5G	0·19	0·67	0·21	0·018	0·024	2·16	0·013
7X	0·15	0·52	0·26	—	—	3·46	0·008
7Y	0·15	0·58	0·24	0·019	0·040	4·72	0·008



	Class "C" steel rod	Alloy steel rod
Piston load .. .. lb.	34,600	34,600
Unit stress, small end .. lb. per sq. in.	6,000	8,460
Vertical stress .. .. ,, ,,	6,325	9,140
Horizontal stress .. .. ,, ,,	6,780	10,450
Inertia stress at wheel-diameter speed lb. per sq. in.	9,950	9,650
Vertical stress at wheel-diameter speed lb. per sq. in.	3,150	2,050
Combined inertia and vertical stress lb. per sq. in.	13,100	11,700
Saving in weight over Class "C" steel rod .. .. .. per cent.	—	30

Comparison of Class "C" alloy steel rods, showing saving in weight effected by use of latter

Pacific Railway adopted nickel steel boiler plate in 1926 in order to increase the boiler pressure by 25 per cent. without any increase in weight. The factor of safety proved actually higher than before, and since then the use

TABLE V.—NICKEL STEEL FOR STAYBOLTS

Chemical composition :	Per cent.
Carbon, max.	0·05
Manganese	0·13 to 0·18
Sulphur, max.	0·04
Phosphorus, max.	0·02
Nickel, min.	2·0

	Hot rolled	Water quenched and tempered
Minimum physical properties :		
Yield point, tons per sq. in.	15·5	20·0
Maximum stress, tons per sq. in. ..	21·5	26·0
Elongation, per cent. on 8 in.	30	22
Reduction of area, per cent.	65	68
Izod impact, ft.-lb.	—	90

TABLE VI.—TYPICAL TESTS OF LOCOMOTIVE CONNECTING RODS

	L.N.E.R.		S.R.		Bengal-Nagpur Railway
	Per cent.		Per cent.		Per cent.
Carbon	0·285		0·3 to 0·33		0·33
Manganese	0·65		0·6		0·52
Nickel	2·42		2·5		3·34
Chromium	0·62		0·6		0·68
Molybdenum	0·37		0·6		—
Heat-treatment	L.N.E.R Oil quench and temper		S.R. Oil quench and temper		O.Q. 850° C. temper 650° C. 2 hr. and O.Q.
	Specified	Actual	Specified	Actual	
Yield point, tons per sq. in. ..	40 min.	44·0	50 to 60	57·6	31·2
Max. stress, tons per sq. in. ..	50 ,,	54·0	60 ,, 70	65·0	52
Elongation, per cent.	18 ,,	22·5	17·5 min.	22	21
Reduction of area, per cent. ..	—	63·6	—	62	59·1
Izod impact, ft.-lb.	—	—	40 min.	62	—
Bend	180 deg. around 1¼-in. diam. bar	180 deg. sound	—	—	—

of such steel has extended to many other railways. The London Midland & Scottish Railway has built and is building a very large number of locomotives fitted with boilers in a nickel steel of which Table II gives particulars.

In this country firebox plates are almost universally made of copper, but in localities where it is the practice to use steel, it is usual to keep the carbon content below 0·15 per cent. and to fix a minimum nickel content of 2·0 per cent. The particulars given in Table III, for which the author is indebted to Colvilles Limited, indicate typical properties obtained from a steel containing 0·12 per cent. carbon and 2·37 per cent. nickel.

The original choice of nickel steel for boilers was based not only on its increased tensile strength but also on the fact that an increase in nickel content in low carbon steels reduces ageing embrittlement as shown by the impact or slow bend tests on notched bars (see Ageing diagram), reduces the grain size which can develop on recrystallisation, and raises the temperature at which grain markings of maximum intensity are observed in strain-etch tests.*

Both copper and Monel metal are largely employed for staybolts, but in cases where steel is favoured a nickel steel is also being used owing to its inherent toughness and ductility. Table V gives details of this particular type of steel, which incidentally is a good substitute for wrought iron in many applications.

It may be mentioned that this steel can be obtained in the form of hollow rolled bars, the centre hole being made by rolling with an austenitic steel core. This results in a very smooth, central round hole and thus reduces the chances of failure by fatigue formerly associated with the small imperfections found on the bore when sand or copper was used in the rolling operation.

* "Nickel Steels Resist Embrittlement," by H. J. French and C. M. Schwitter, *Iron Age*, July 14, 1932

(*To be continued*)

RAILWAYS AND ROAD TRANSPORT SECTION

This section appears at four-weekly intervals

Railway Interests in Road Freight Services

BROADLY speaking, the interests of the British railways in passenger road transport are by shareholdings in the actual operating companies, and not through the parent holding companies, nor by direct operation of vehicles by the railway companies. With freight-carrying concerns, however, the railway interests take three forms: (1) the direct ownership of extensive fleets of road vehicles; (2) large shareholdings (amounting in some cases, *e.g.*, Hay's Wharf Cartage Co. Ltd., and Carter Paterson & Co. Ltd., to complete ownership), in road transport firms; and (3) indirect interests in other firms of road hauliers through shareholdings in the latter which are held by direct railway associates.

For many years the railway companies worked road freight vehicles in connection with the collection and delivery of goods carried by rail, and considerably wider powers were obtained by the passing of the Railway (Road Transport) Acts of 1928. At the end of 1935 the London & North Eastern Railway owned 3,033 parcels and goods motor vehicles, the London Midland & Scottish Railway owned 2,727 vehicles, the Great Western Railway, 2,010 vehicles and the Southern Railway 563. Under the powers obtained in the Acts of 1928, the railway companies immediately turned their attention to effecting working arrangements and joint interests with operators of passenger road services and it was some time before goods carriers were approached.

The first freight-carrying concerns in which the railways obtained interests were Joseph Nall & Co. Ltd., and Wordie & Co. Ltd., now L.M.S.R. associates, and Currie & Co. (Newcastle) Ltd., in which the L.N.E.R. secured an interest. Wordie & Co. Ltd. operates over 130 vehicles, mainly in Scotland and northern England; the firm has been in existence for over 200 years. In December, 1935, Wordie & Co. took over the haulage business and 12 vehicles of James Dick, of Blairgowrie, Perthshire, and the business of Smith Brothers, of Kinrossie, Perthshire. The latest Wordie acquisition is that of John Russell & Sons, of West Calder, a haulage business using some 17 motor lorries and half a dozen trailers, mainly in cattle transport. Currie & Co. (Newcastle) Ltd. operates over one hundred vehicles and holds a financial interest, acquired in July, 1935, in John Grocock Limited of Sheffield, which company works some 50 goods vehicles.

The greatest interest of the railway companies in freight-carrying concerns was secured in 1933 when, on October 31, they assumed control of Carter Paterson & Co. Ltd., and Pickfords Limited, each of the four railways purchasing one quarter of the ordinary share capital of Carter Paterson & Co. Ltd., and of the Hay's Wharf Cartage Co. Ltd., the parent company of Pickfords Limited.

Carter Paterson & Co. Ltd. operates over 900 motor vehicles from 50 branch establishments, and has over 5,000 receiving offices. It has obtained control of a number of cartage contractors in various parts of the country. Among the largest of these is Bean's Express Limited which employs, on hire and contract work, several hundred vehicles, including 3-wheelers, 5 cwt. Austin vans, Morris vans from 5 to 30 cwt., 50 cwt. Thornycroft and Albion vans, 5 ton Leyland lorries, and electric vans for local work. The two Sutton companies—Sutton & Co. Ltd. and Sutton & Co. (Manchester) Ltd.—which own nearly 200 vans and have 600 branches and agencies, became associated with Carter Paterson & Co. Ltd. in October, 1935. Other freight-carrying concerns in which Carter Paterson is interested include Karriers Parcels Delivery Limited, of Liverpool, owning about 30 vehicles; T. R. Nickson, of Liverpool (now absorbed into Karriers Parcels Delivery Limited); Leicester and County Carriers Limited; South Coast Carriers Limited, of Arundel, Sussex; R. G. England; and Powers & Privileges Limited, of Ipswich.

Pickfords Limited and the parent company, the Hay's Wharf Cartage Co. Ltd. have also recently acquired interests in several firms of cartage contractors, in addition to some of long standing. These include the London Traction Haulage Co. Ltd.; John Smither & Son Ltd.; J. & H. Lindsay Limited; Norman E. Box Limited, of Manchester, Robert Hall Limited; Shillitoe & Minter; Briars & Son Ltd., of Leicester; G. Carter & Son, of London; A. T. Seaton, of Mountsorrel; W. G. Bond, of Richmond; Venn & McPherson Limited, of Newport, Mon., the operator of 36 vehicles from depots at Newport and Birmingham; Chaplins Limited with a fleet including 50 motor vehicles and many horse vans; and Garlick Burrell & Edwards Limited, of Liverpool, with over 130 lorries and vans. On May 31, 1934, Pickfords Limited took over the goods transport section of the Birmingham & Midland Motor Omnibus Co. Ltd., which that company had operated in connection with its bus services and also by separate vans.

The London Passenger Transport Board is no longer concerned with the carriage of goods, as the parcels delivery service of the Metropolitan Railway was taken over by the main line railways on July 2, 1934.

Fixed Bus Stopping Places

FOR many years the L.G.O.C. endeavoured to educate its passengers to use specified stopping places. Posts marking stopping places were erected experimentally (largely as a war-time measure) in 1918, and since that date have increased throughout London. The company's efforts met with only partial success, however, as by law Metropolitan stage carriages were still compelled to stop at any point (with a few safety exceptions, mainly in central London) on being hailed. In the changed circumstances of the Road Traffic Act of 1930, the London Passenger Transport Board arranged that, from Wednesday, March 20, 1935, its buses should stop, between Euston Road (Hampstead Road) and Seven Sisters Corner,

only at indicated compulsory or request stops. This experiment has since been extended, and, on January 8 last, it was applied to Commercial Road and Barking Road, between Aldgate and Barking Broadway; and, on January 15, to the route between Victoria station and Downham. It is expected that the arrangement will gradually be extended to the whole of London. Stopping only at fixed points, of course, has been the practice of tramway concerns for many years, and the London County Council obtained powers to fix tramway stopping places in its Act of 1909.

It has also been the practice in many country places to erect posts to indicate stopping places and in fact it is there that the utility of the scheme has been most clearly shown. There intending passengers from villages off the main road are able to know exactly where and when to meet the bus to take them to the town or to the railway station. The villagers get to know the times the vehicles pass these points and as the time tables are closely worked to it is seldom that a passenger is kept waiting. It has to be noted, however, that these stops are not compulsory as are the London ones referred to.

Collection and Delivery Sorting

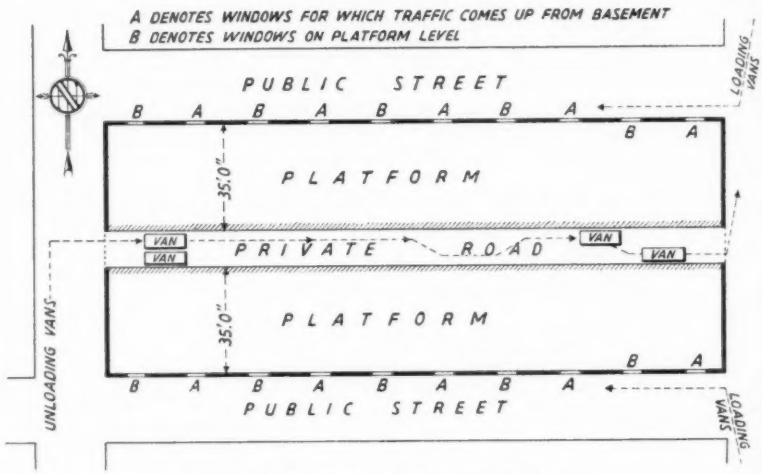
A system adopted in the Sutton depot at Manchester whereby the distribution of the traffic is effected as the vans progress through the depot

A SUBJECT which must always be the study of those who are engaged in collection and delivery work is that of reducing the station detention time to the minimum. Closely bound up with it also, is the question of the labour required to effect the sorting out of the incoming traffic and its distribution to the places where it is to be loaded on to the outgoing vans. In these pages in recent months there have been described and illustrated various schemes to carry out these operations efficiently, with the minimum expenditure of time and labour.

It may be recalled that at the new Pickford depot at Willow Walk the incoming packages as they are unloaded are placed on four-wheeled platform trucks which are hauled in trains by a Lister truck to the bays where the goods are transferred to the outgoing vans for the different districts. Another scheme is employed at the new Carter Paterson depot at Surbiton, where endless belt conveyors are installed, the design being based on the successful use of the idea at other depots. As they are unloaded, whether from the collecting vans or from containers bringing traffic in bulk, from other depots, the goods are placed on the conveyor and they are pulled off the belt by the checkers when they are passing the appropriate bay from which they are to go out for delivery.

Another scheme in which the incoming vans are made to do the sorting and unloading at the same time is being successfully worked at the Sutton depot in Manchester. The principle upon which it is based can be studied in the sketch plan, from which it will be seen that the depot is situated between two public streets, which, however, are for all practical purposes used only by the Sutton vehicles. Through the middle of the depot runs a private road, sufficiently wide to allow room for two vehicles to pass easily, and the result is to provide two platforms, each about 35 ft. wide. The one-way traffic rule is followed, the incoming vans entering the depot at the west end of the central road. Above each of the banks destination boards are arranged at intervals, and calls are made at each of the bays for which goods have been collected, changing across to the opposite side, if necessary, for articles to be unloaded at the destination board there, and then back again as required until the vehicles have traveiled the length of the road and distributed all the goods brought in.

In other words, the vehicles are made to perform the function of a moving platform through the middle of the sorting platform. They are a moving platform from which unloading can be effected on either side. No unloading is done from the back; all the vehicles have either open sides or sides which can open. Few of the vehicles have fixed tops, but they have a fixed bar about seven feet above the floor, over which a tarpaulin is placed. The delivery vans are loaded in one or other of the public streets from the openings in the walls indicated.



Layout of the Sutton depot at Manchester

It will thus be seen that the amount of trucking is very small, as the goods have to be moved only across the platform from the point where they are taken off the van to the window where they are loaded for delivery.

Experience has shown that the despatches for the railways can be made at a different time to that at which the vans are loading for the district distributions, so the work of the depot can be spread over the working day more evenly than would otherwise be the case. On this account, too, the railway traffic is unloaded at one point where it is taken by a shoot to the basement. There it is sorted out and then sent up to windows in the outer walls, intermediate to those from which the district traffic is loaded, ready for delivery to the railway vans when they call for it. So the streets are used by two sets of vans without causing any congestion.

£28 Million Danish Road and Rail Scheme

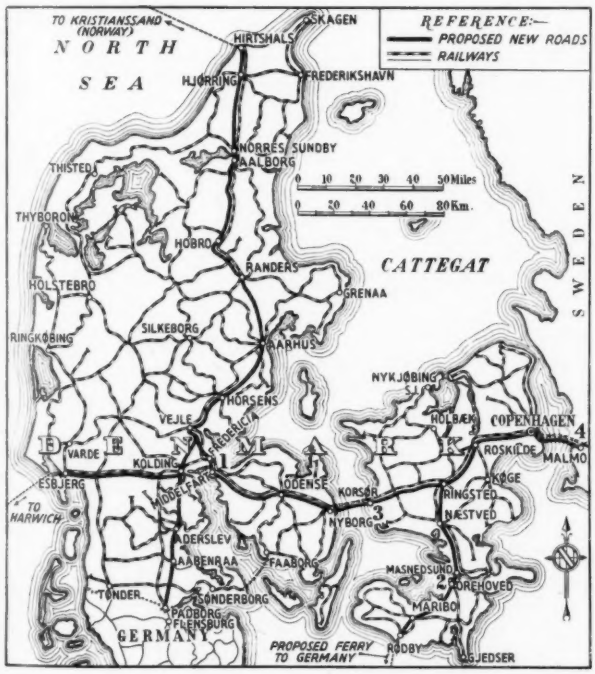
A brief description of this ambitious project which involves two eleven-mile high-level bridges and directly connects Germany, Denmark, and Sweden by railway and road

WITH the triple purpose of improving communications between Scandinavia and Western Europe, of modernising the Danish highway system, and of reducing unemployment, a scheme has been submitted to the Danish and Swedish Governments which provides for the construction of combined highway and railway bridges across the Oresund and the Great Belt, together with a system of modern motor highways through Denmark.

The total expenditure is estimated at about £28,000,000, and the plan, which calls for completion within a period of 10 years, has been elaborated by a group of three well-known construction firms: Christiani & Nielsen, Højgaard & Schultz, and Kampsax, in agreement with the Danish Government, which has placed some of its officials at the disposal of the firms. Also, as far as the bridge across the Oresund is concerned, the Swedish construction firms Armerad Betong and Skanska Cementgjuteriet have been active members of the group.

The Proposed Highway System

From the accompanying map of Denmark, showing the proposed motor highway routes, it will be seen that these are projected from Malmo in Sweden across the Oresund to Copenhagen, and from Copenhagen across the Danish islands to Esbjerg, where there are good and frequent connections to British and Continental ports. From this trunk road a branch is to be carried over the Storstrøm bridge—which is at present under construction by the British firm, Dorman, Long & Co. Ltd., in collaboration with Christiani & Nielsen—to Rødby on Lolland, whence there is to be a new ferry to connect the new road with the German *autobahn* system. Finally, a trunk road is to be carried through from Hirtshals, where a ferry to Norway is soon to be established—as recorded this week on page 699, down through Jylland to Flensburg, where it will link up with the German highways.



1—Little Belt bridge, completed
2—Storstrøm bridge, under construction
3—Great Belt bridge, proposed
4—Oresund bridge, proposed

Sketch map showing the proposed highway alignments and four great bridge sites

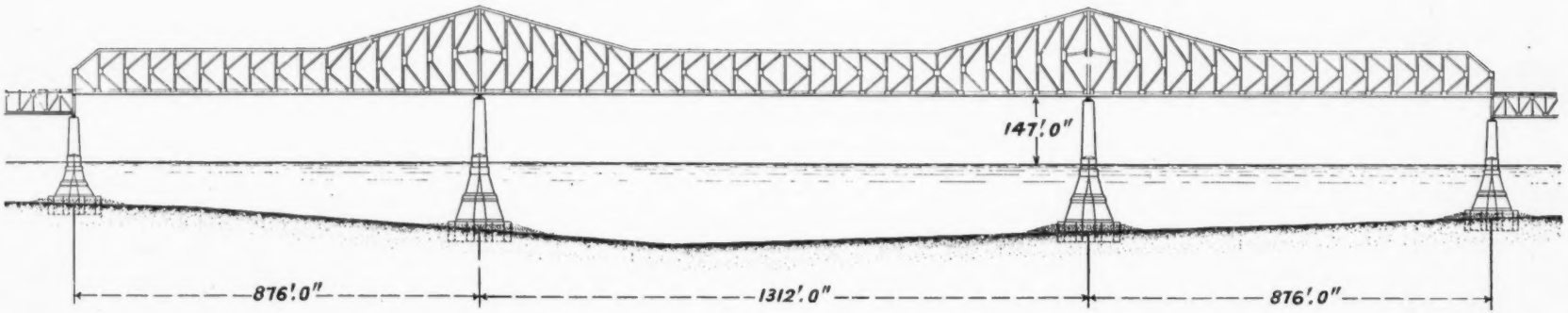
Sketch looking along one of the proposed Oresund 1,000 ft. navigation spans, showing railway and 27 ft. roadway

Reasons for the Scheme

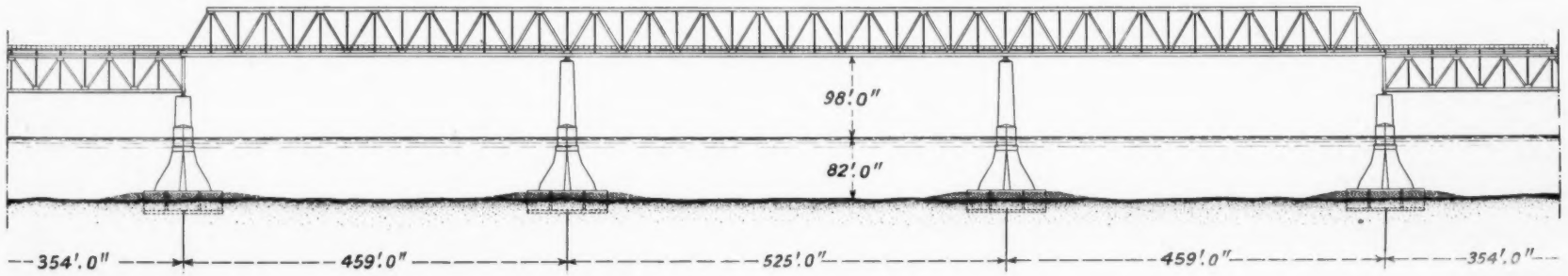
This scheme has been prepared because investigations have shown that the Danish highway system, though extensively modernised during the last ten years, will very soon be unable to carry the traffic arising from the present fast development of motor traffic, and that a system of motor roads as proposed is the only satisfactory solution of the traffic problem. When completed, this combined system of roads and bridges will fundamentally change traffic conditions in Northern Europe, as it will place Scandinavia in direct connection with the rest of the Continent.

Hitherto, at least two ferry crossings, and also long detours, have prevented the running of fast express trains to and from the capitals of Northern Europe, and have also deterred many motorists from visiting this part of Europe. The scheme has therefore aroused great interest, not only in Denmark and Sweden, but also in Norway and Finland, all of which countries feel their present isolated position and are strongly in favour of any measure

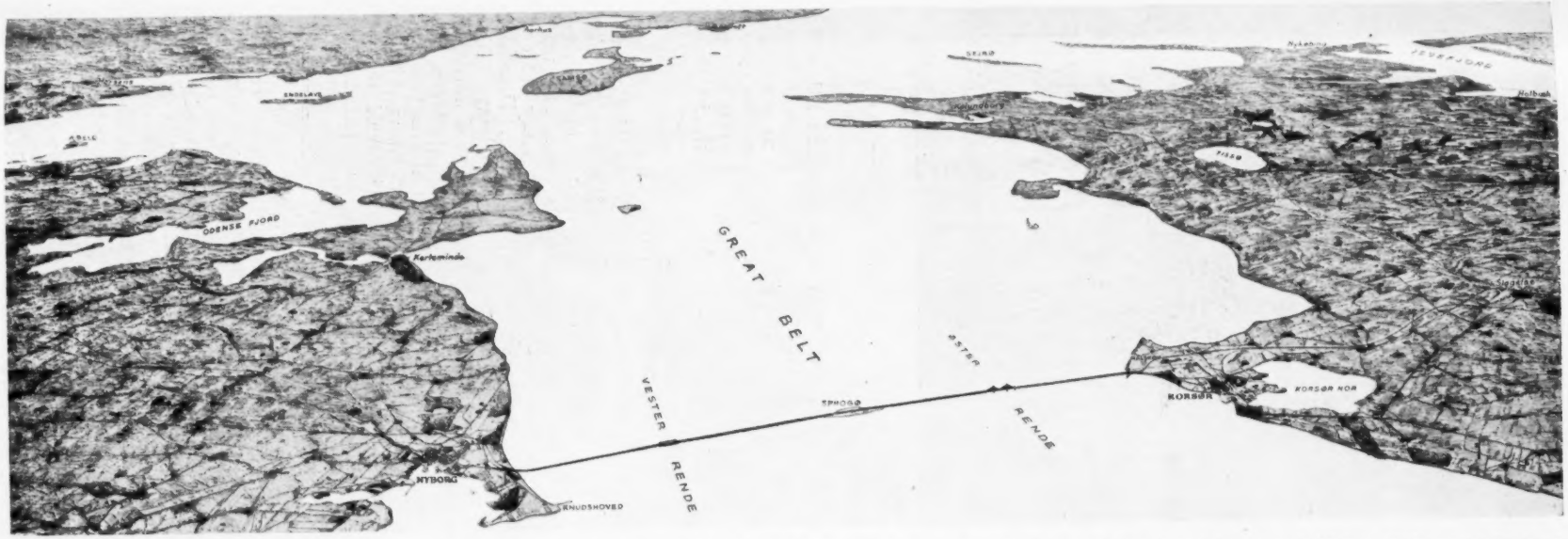
The proposed 1,000-ft. bowstring girder span over one of the main navigation channels of the Oresund which separates Copenhagen from Malmo (Sweden)



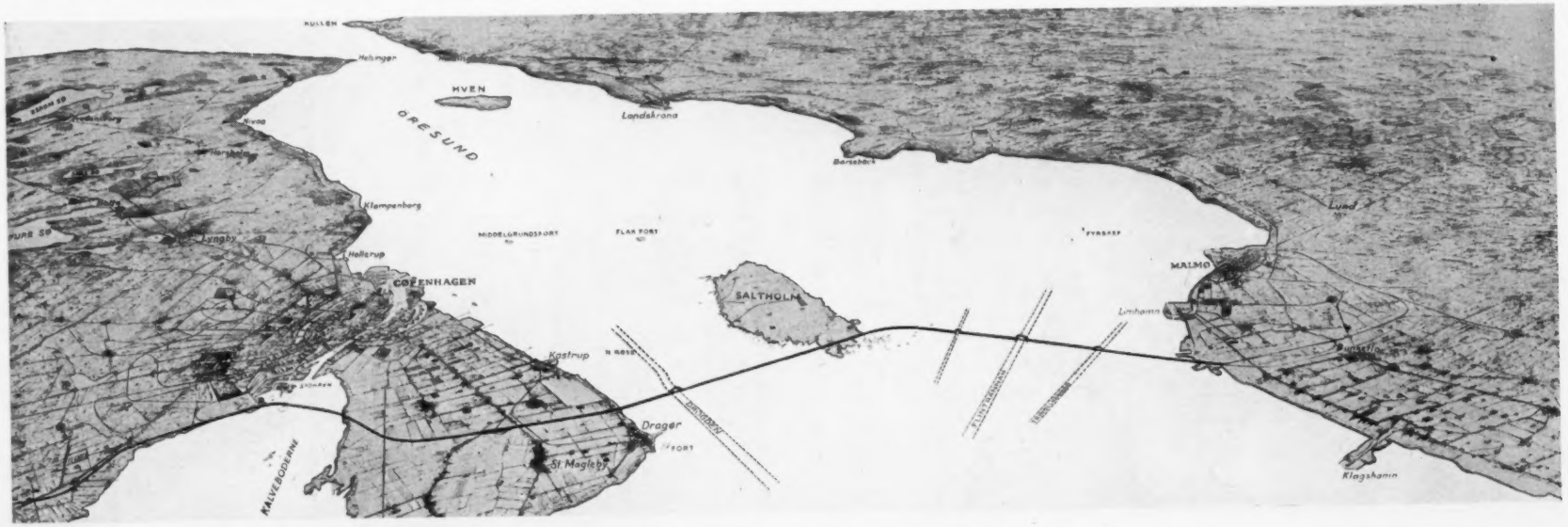
Cantilever navigation spans over the Oster Rende or principal channel of the Great Belt (or Storebaelt) in the bridge proposed between Nyborg and Korsor



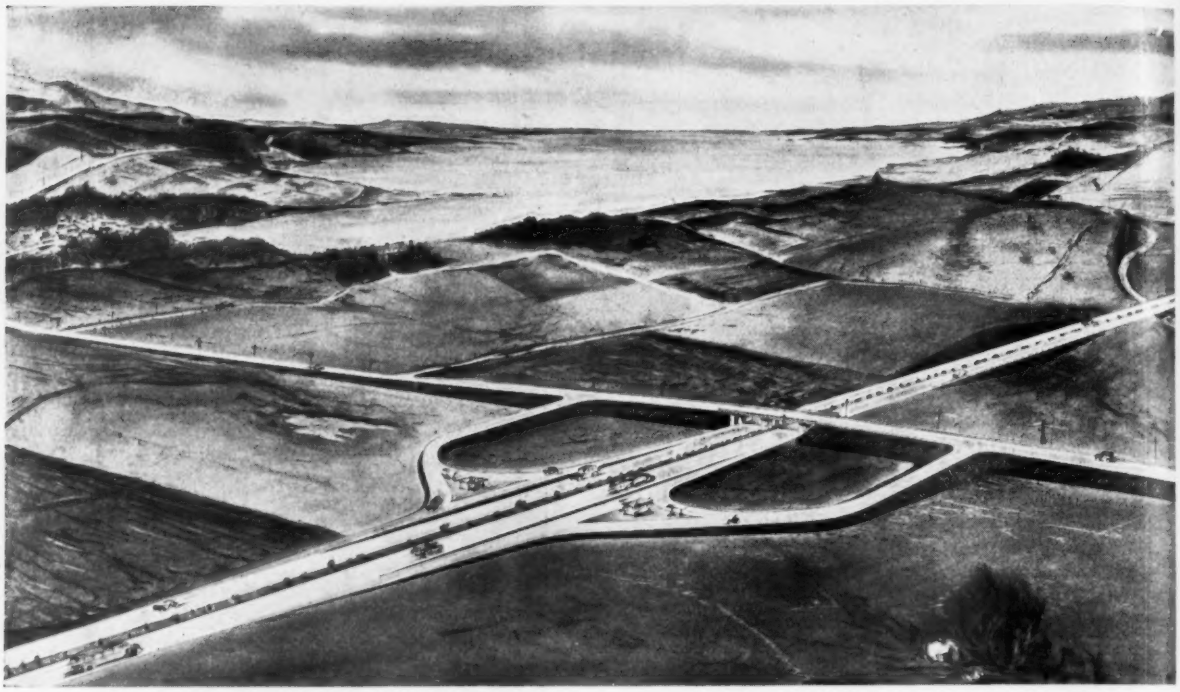
Proposed navigation spans over the Vester Rende, the secondary main Great Belt channel



Bird's eye views of (above) the Storebaelt, or Great Belt, strait that separates the islands of Fyn or Funen—on which are Middelfart, Odense, and Nyborg (left)—and Zealand (right) the principal Danish isle, upon which is Copenhagen : and (below) the Oresund between Zealand and Sweden, with Copenhagen and Malmö on the respective shores



PROPOSED BRIDGES OVER THE GREAT BELT AND ORESUND



Bird's eye sketch showing express highway crossed by an ordinary main road with a flying junction as standardised in the scheme

that will put them in closer connection with the rest of Europe.

Details of the Proposed Highways and Bridges

The highway system is to be constructed on most modern lines, with two separate road tracks, each some 20 ft. wide and separated by a 10-ft. island strip planted with bushes. Flying or burrowing junctions or over- or under-bridges are to be provided at all intersecting roads and railways, and no access from buildings along the road is to be allowed except at access roads spaced at about 15-mile intervals. It should therefore be possible to drive in safety at an average speed of up to 100 m.p.h.

The most interesting feature of the project is, however, the two proposed combined rail and road bridges across the Oresund and the Great Belt, each of which is to be about 11 miles long with a 27-ft. roadway and a 9-ft. track for bicycles. These bridges will be by far the longest in Europe, and only one bridge in America can be compared with them.

The Oresund has two main navigation channels, each of which is to be bridged by a single 1,000-ft. bow-string span, and a third channel is to be crossed by a 650-ft. span. The main channel of the Great Belt will require a cantilever type trio of spans, the centre one about 1,300 ft. and the two side ones each some 900 ft. in length: a secondary channel will be spanned by three 500-ft. openings. To enable shipping to pass under the main navigation spans, a headway of about 150 ft. is allowed.

Finance and Policy

In order to finance this great scheme, one-third of the total sum required is to be raised by floating a loan to be repaid in 30 years: another third is to be provided from petrol and motor vehicle taxes, and the final third is to be subscribed by the Treasury out of funds saved from the dole, and increased taxes. Detailed plans, drawings, and estimates of the highways and bridges have been submitted to the Danish and Swedish Governments, and a committee has been appointed in Denmark to examine these. In view of the present unemployment the commission has been instructed to present its report as soon as possible, and it should, therefore, not be long before the results of its investigations and its recommendations are known.

Co-ordination in Queensland

The State Transport Board, until quite recently, had been hampered to some extent in its operations due to the regulations which were promulgated under the " State Transport Act " having been the subject of litigation, during the course of which many road operators ran their vehicles in defiance of the regulations and refused to pay the prescribed fees. The decisions of the Courts, however, have now placed the position beyond doubt and there has since been a considerable tightening up of the control.

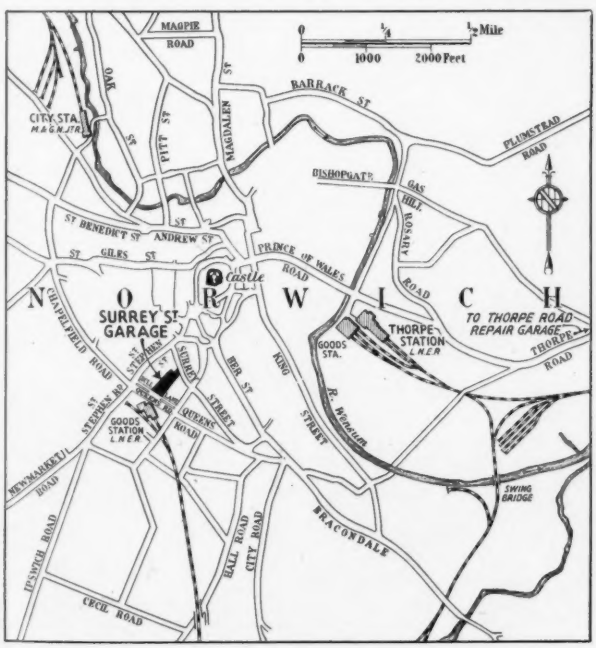
An important feature of the board's operations has been the establishment of quite a number of co-ordinated road and rail services for both passengers and goods between the metropolis and places within a radius of 100 miles thereof. In certain instances the road operators collect the goods, consign them to the nearest railway station to the destination, and deliver them from that railway station to consignees. In other instances, the road carriage of the goods in the metropolitan area is not part of the co-ordinated service. The arrangement of these services has enabled the railway to recover traffic which had been diverted to the roads, and charges have been so adjusted that the through fares and freights by the co-ordinated services—which, to a large extent, have been based on the railway schedule of fares and freights for the combined rail and road distances—are less than was the case prior to the establishment of these services.

New Bus Station and Garage at Norwich

The new Surrey Street depot of the Eastern Counties Omnibus Co. Ltd., which largely replaces the Thorpe railway station bus terminus, provides the city with a more conveniently situated road transport centre

AS was briefly recorded in THE RAILWAY GAZETTE for March 27, the new Surrey Street bus station and garage of the Eastern Counties Omnibus Co. Ltd., a railway-associated concern, was recently opened by the Lord Mayor of Norwich. The new premises, which occupy a site near the centre of the city, will largely replace the present Thorpe railway station bus terminus, and the old garage at Thorpe Road is being converted into a repair depot. This arrangement, which combines the bus garage and station, obviates the former costly practice of running buses empty for nearly a mile between the old garage and Thorpe station. The change also became desirable consequent upon the taking over control of the Norwich Omnibus Company by the Eastern Counties Company. The absorbed company was responsible for the operation of some 85 buses and tramcars within the Norwich area, and the necessity for some central terminus was felt to be essential for the efficient running of these services, especially as the trams have recently been scrapped and replaced by motor vehicles.

The new premises are situated between Surrey Street and Queens Road, two parallel roads about 120 yards apart. The bus station takes the form of a wide sloping thoroughfare connecting the two streets with a single continuous platform down each side. These total 800 ft. in length. Although access is thus obtainable from both ends, local traffic conditions make it impossible at present to institute a system of one-way traffic. The platforms, which are divided into 19 numbered bays, are protected by glazed canopies, beneath which are suspended appropriate indicator boards showing the departure points for the 30 services using the station. In addition, at intervals,



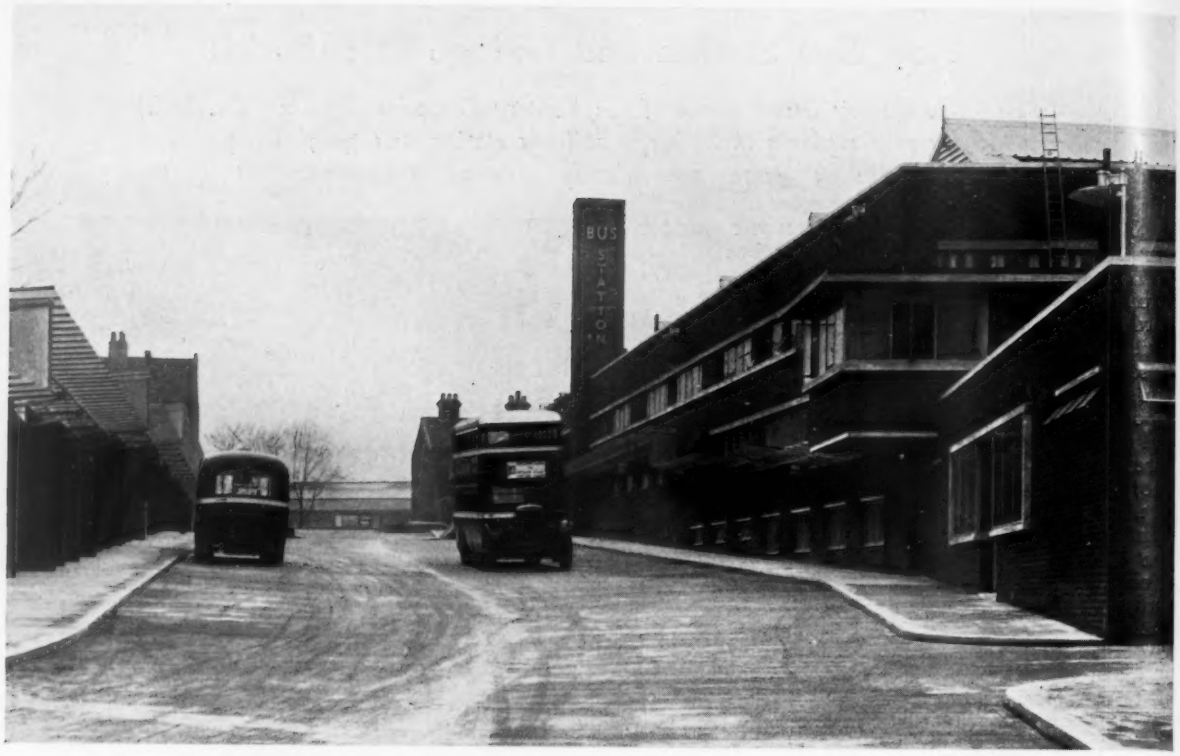
Map of Norwich showing site of new Surrey Street depot

Station platform showing indicator boards and loudspeaker equipment

traffic control loudspeakers are fitted. These, numbering 20 in all, are operated from a control tower which is situated near the waiting rooms, commands a view of the entire station, and is in telephonic communication with the administrative offices. The loudspeaker equipment was supplied by Broadcast & Acoustic Equipment Co. Ltd.

The public offices are all at the Surrey Street entrance and include a two-storey enquiry office at which seat reservations can be made and luggage deposited. Adjacent to this is the large and pleasantly set out waiting room. The administrative office and staff quarters, however, form part of the garage building proper, which lies alongside the station roadway at the Queens Road end. In addition to a canteen and stores section, there is a conductors' ticket issuing and receiving office together with accommodation for an audit department.

The garage, capable of holding some 170 vehicles, has a floor area of 52,000 sq. ft., which is left free from obstruction as the roof has a clear span of 180 ft. by 360 ft. The total paved area of the garage and station is 85,000 sq. ft. Petrol and diesel oil is supplied from six storage tanks, each with a capacity of 5,000 gall.,



General view of bus station thoroughfare with side platforms. The garage building is on the right and the control tower may be seen projecting above the waiting room

The entrance to the garage from the station thoroughfare. The garage, which has a clear floor space of 52,000 sq. ft., has a capacity for 170 vehicles

Enquiry office at the Surrey Street entrance

Waiting room, with large observation windows

to four refuelling stages. The tanks are refuelled by pipe line direct from the L.N.E.R. goods station which lies just beyond Queens Road. An important feature of the garage equipment is a power-washing plant, supplied by the Simplex Electric Co. Ltd., which is capable of cleaning four buses simultaneously; the operation takes only 2½ min. Ventilation is by means of fans suspended in the steel framework of the roof. These and the lighting system are also supplied by the Simplex Electric Co. Ltd. As repairs are now carried out at the old Thorpe Road garage, the Surrey Street depot has been provided with little machinery equipment. There are, however, four pits for light repairs, and a recess under the canteen provides space for a small workshop. The garage is heated from boilers which have an output capacity of 3,000,000 B.Th.U. an hour, and which are fed by "Iron Firemen" automatic stokers.

The architect was Mr. H. J. Starkey, A.I.A.S., and the general contractors George A. Kenney & Sons. Mr. F. C. Jones was the clerk of works.

Road Transport Legislation in Germany

THE new Act regulating long-distance freight transport by road (Gesetz über den Gueterfernverkehr mit Kraftfahrzeugen), passed in June, 1935, came into force in Germany on April 1, 1936. The reason for this new regulation was the failure of the 1931 decree to put an end to the chaotic conditions in the road transport industry and to establish fair competition between road and rail. The provisions of that decree included the licensing system for professional road hauliers over distances of more than 50 km. (31 miles). To protect the railway rates system, a special road transport tariff had been introduced, which conformed in its main outlines to the railway rates for high value commodities—Classes A, B, and C. These rates, however existed only on paper; in practice the road hauliers, by secret rebates and other means, evaded the obligation placed upon them by the decree. The position was summed up by Dr. Dorpmüller, General Manager of the German State Railway, in the following statement:—

> The regulation exists on paper that the motor cannot carry goods at rates lower than the railway. It has been so for the last fifteen months (1933), but, as far as we are concerned, with absolutely no results. Consequently, it is not possible to fight the road by increasing our railway rates, and laws against it are of no avail either. Nor is it possible to come to agreements with the owners of road motor vehicles. These people pretend to observe the regulations, but in actual fact elude them, while the State railway keeps within the law.

The possibility of a railway monopoly for long-distance freight transport by road was then seriously taken into consideration, but was discarded. It was felt that the development of the long-distance freight transport was not a matter to be left exclusively to the railways.

The new Act provides a compromise, in so far as the principle is adhered to that on the one hand road transport shall be free to compete for the traffic, but on the other that there shall be much stricter regulation and control of the road haulier. For this purpose a national road transport association is to be founded, the task of which will be to supervise the activities of the road haulier.

The new Act is designed "to ensure a fair competition between railway and road transport." The first part deals with general provisions, which lay down that every one who wants to carry goods beyond the 50-km. limit for hire and reward must have a permit (the limit is reckoned from the place where the vehicle is permanently stationed). No licence is necessary for the transport of postal packets —with the exception of piece goods—or for the ancillary user. The permit is granted by the authority within whose district the business is situated, and is valid for the whole country. The licence is granted separately for the undertaking as such, and for the number, type and use of the vehicle, *i.e.*, without special permission no change in the number of vehicles nor in the type and use of the vehicles may be made. The permit may be given only:—

> 1.—If the haulier is reliable and can guarantee safety and efficiency of operation. A licence will be granted only where the character of the haulier is an assurance in itself that he will fulfil the conditions and comply with the rates and regulations.
>
> 2.—If there is a national economic demand for it. The interpretation of this clause will probably present a great number

German State Railway express bus on the new motor road from Frankfort-on-Main to Mannheim and Heidelberg

of difficulties. As the licence, although granted by the local authority, is valid for the whole country, that body will have to take into consideration factors which lie outside its sphere of control.

3.—If the owner of the licence does not run any other business but long-distance freight transport. (This clause is directed mainly against the custom of secret rebates, which was facilitated under the old legislation by the combination of various types of businesses. These rebates or other facilities were indirectly given by one of the other departments of the combine. It has been noted already in reports that out of approximately 10,000 licensed road hauliers, only 60 to 65 per cent. have maintained their claim to be one-business enterprises.)

The next part of the Act deals with the problem of the National Road Haulage Association, into which all the licence holders are to be combined. This association is meant to be a kind of supervisory body to control the activities of members regarding:—

1.—Development and organisation of long-distance freight transport by road.

2.—The provision of storage facilities, the use of which is open to all members.

3.—The calculation, invoicing, and payment of the transport rates.

4.—The insurance of the transported commodities.

5.—The supervision of the legal obligations of the contracting parties.

Among these points the third is obviously the most interesting, as it constitutes the strictest possible control upon compliance with the road haulage rates, and the strongest measure yet taken in any country to prevent discrimination in the form of rebates or otherwise. The association itself is subject to the authority of the Minister of Transport.

Part 4 deals with rates. The tariff for road transport is the subject of agreement between the National Road Haulage Association and the German State Railway. It contains all the information necessary for the calculation of rates and supplementary charges, as well as that relative to conditions of transport. The rates are sanctioned by the Minister of Transport, and where rail and road concerns cannot reach an agreement the Minister can fix the charges as well as demand their alteration at any time he thinks necessary. Administrative and legal authorities are bound by the decision of the Minister. The rates, and any alterations, must be published. They become valid from the moment of their publication, except in the case of an increase, or the introduction of less favourable traffic regulations; then a minimum period of two weeks has to elapse before these changes come into effect. Rebates or other facilities in direct or indirect form are forbidden, and heavy fines are imposed for breach of this regulation. In order to facilitate the supervision of haulage contracts, haulier and consignor have to fill out lading papers in a prescribed form, giving necessary details. The Minister of Transport has the right to inspect the books and papers of all parties.

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10 DAYS TO THE NIGER. By taking advantage of the regular coach service run by the Cie. Gle. Transaharienne between Colomb-Bechar (easily reached by rail or car from Algiers or Oran) it is possible to reach Nigeria in 10 days from London. The coaches, equipped with sleeping berths, run across the Tanezruft desert and from Gao and Niamey, most of the districts in West Africa, including British Nigeria can be reached.

MACHINING LOCOMOTIVE PARTS AT CREWE WORKS, L.M.S.R.

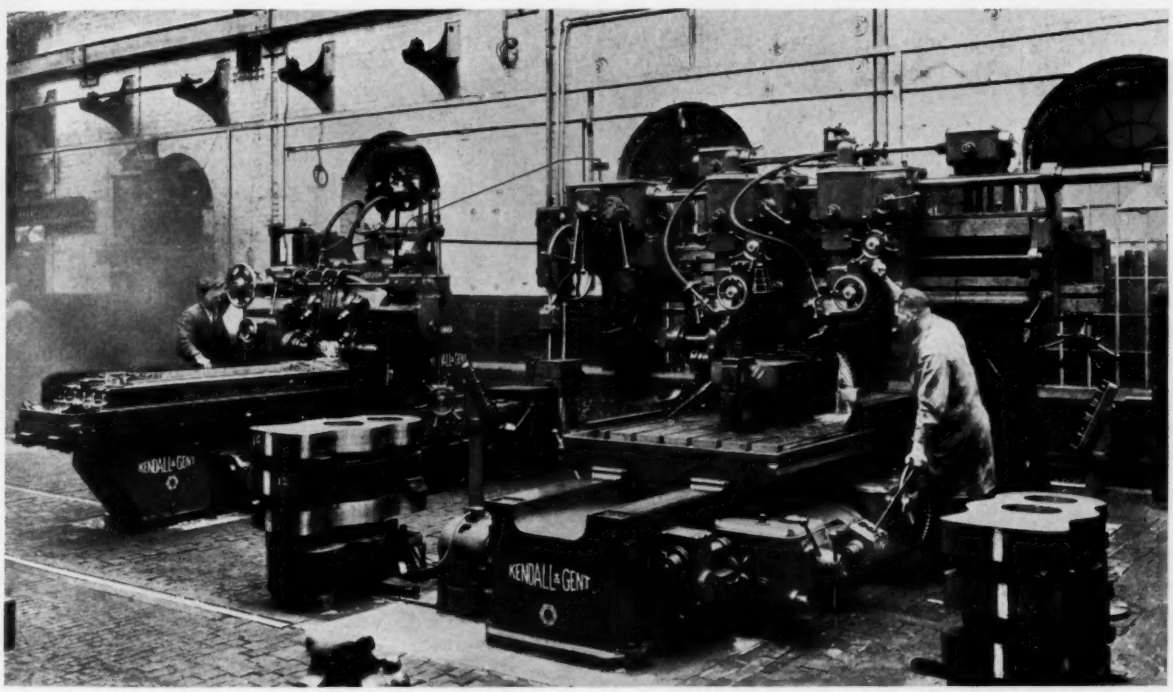
THE accompanying illustration shows two Plano milling and profiling machines recently supplied by Kendall & Gent and installed at the Crewe works of the London Midland & Scottish Railway. The machine on the left is designed for dealing with all classes of slab milling, and is seen milling the joint faces of locomotive eccentric rods. The four operations involved in the work of machining these rods are as follow:—

1.	Milling edges and necks	.. .. ..	four rods at once
2.	,, taper flute	.. ..	two ,, ,,
3.	,, flats	.. ..	two ,, ,,
4.	,, four faces	.. ..	one rod ,,

The floor-to-floor times for each operation are respectively (1) 15 hr. 24 min.; (2) 7 hr. 51 min.; (3) 9 hr. 30 min.; (4) 4 hr. 0 min., the speed and feeds being 47 ft. per min. and 2·1 in. per min. The patent profiling motion incorporated in the machine enables work on locomotive rods, links and other similar components to be machined to the correct form in quantities, with the same facility as plain slab and form milling. The capacity of the machine for milling is 2 ft. 3 in. wide by 9 ft. long.

The duplex milling machine shown on the right of the illustration is seen milling the edges of crank webs. These are 5 in. deep, and the material is manganese molybdenum steel having a tensile strength of 40-45 tons. The floor-to-floor time for these articles is 11¾ hr., milling speed 37 ft. per min. and feed 1·32 in. per min. High speed steel cutters 4 in. dia. are used.

The machine has two vertical milling heads mounted on an auxiliary slide carried on the cross slide, each having independent adjustment on the slide for setting purposes. The work can be mounted on the table in two gangs, and the milling heads set on the slide for the required cut. A wide range of spindle speeds is provided so as to accommodate all classes of work. The machine has a capacity to mill 4 ft. 6 in. wide by 2 ft. high by 10 ft. long.



Kendall & Gent Plano milling and profiling machines at Crewe works

We are indebted to Mr. W. A. Stanier, Chief Mechanical Engineer of the London Midland & Scottish Railway, for facilities for photographing the machines in the Crewe works, and for the information incorporated in the above description.

PRODUCTION AT THE DARLINGTON FORGE.—Following a process of modernisation, production has now begun at the Darlington Forge works of the English Steel Corporation. The first cast of steel has been tapped in the melting department, which department will at once go into full production. It will provide steel for the forge and foundry for use in the manufacture of high-quality forgings and castings for the marine, electrical and general engineering industries, and in addition, for carbon and alloy steel ingots up to 100 tons in weight. Foundry work will be confined for the time being to steel castings of from 15 cwt. to 100 tons in weight. A new heat-treatment plant is being erected to secure additional efficiency in this important process. It is felt that the more efficient and additional capacity of the works will be of great assistance to the industry, and of special interest to North-East Coast shipbuilders and engineering firms. The company will continue to install modern equipment, including new machine tools, to meet the developments occurring since the works closed down in 1932.

View from the clock tower, looking east, with roof of railway station in foreground and the approach road viaduct seen beyond. Docks and town in background

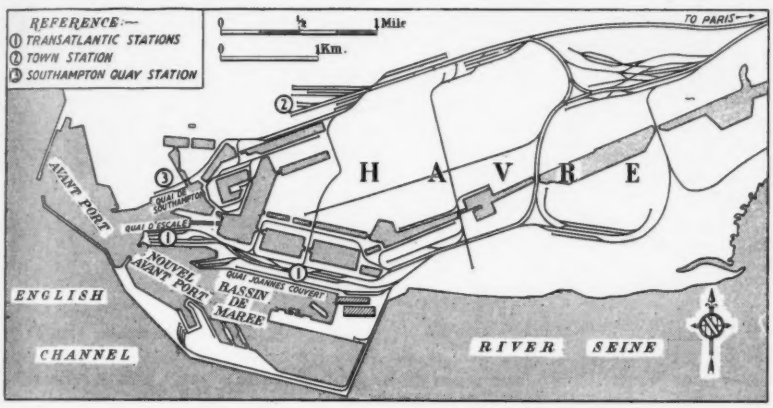
Looking west from the clock tower. The old sheds of the Quai Joannès Couvert are in the foreground

THE GARE TRANSATLANTIQUE, LE HAVRE

THE GARE TRANSATLANTIQUE, LE HAVRE

The new harbour station at Le Havre, which was opened by the President of the French Republic on May 23 last, marks another stage in the improvement of connections between railway and sea travel in France, of which we described a similar example—the Gare Maritime at Cherbourg—in our issue of December 14, 1934. The station, officially entitled the Gare Joannès Couvert, but commonly known as the Gare Transatlantique, is situated on the Joannès Couvert quay of the Compagnie Générale Transatlantique, alongside which the largest liners can be berthed. The previous station was built on the Quai d'Escale, because at that time the accommodation for transhipment on the Quai Joannès Couvert was limited. It will be seen from the map that the branch to the Quai d'Escale from the Paris—Le Havre main line passes at the rear of the new station, which is reached by a loop therefrom. The harbour line has now been improved to allow the passage of trains at speeds up to 50 km.p.h. Formerly, the fact that the line was unfenced, had many level crossings, and passed through the middle of the busy traffic on the quays, limited speed to a walking pace.

The Quai Joannès Couvert and the Gare Transatlantique. The railway station is at the rear of the buildings shown, which are those for handling the transfer of traffic between train and steamer

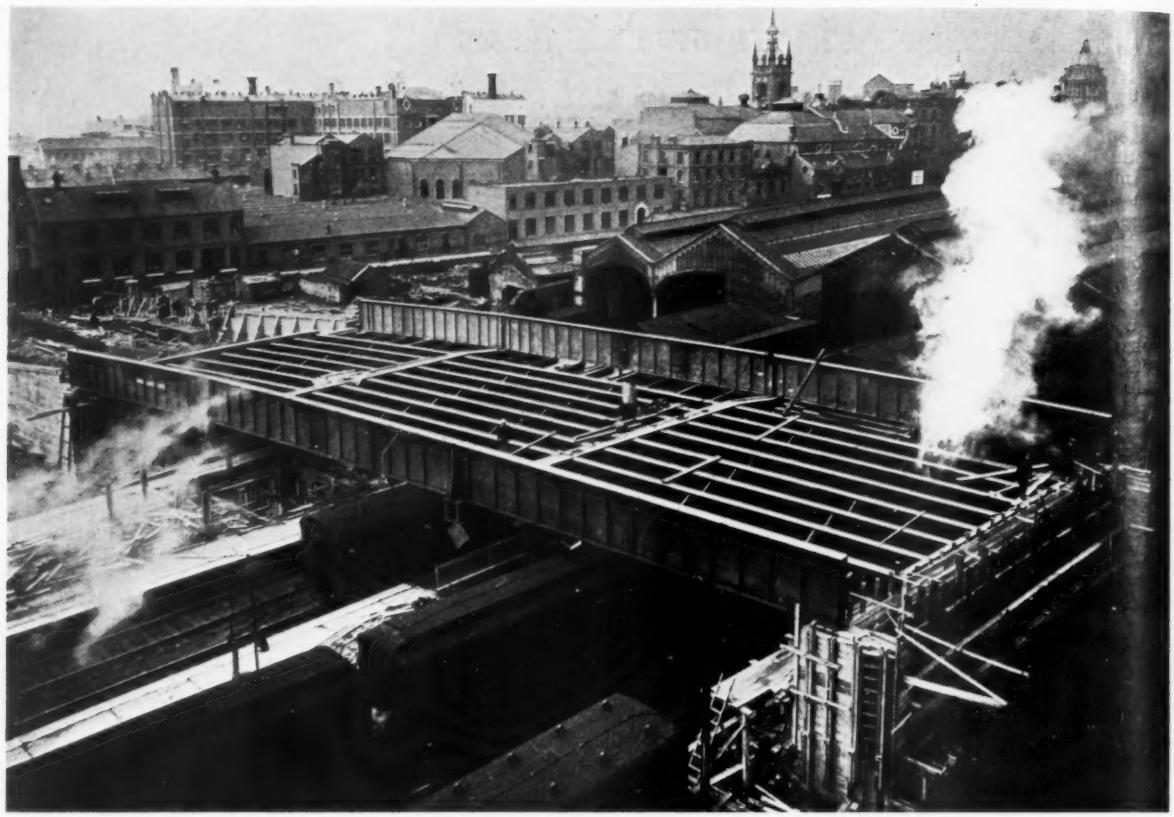


Plan of quays at Le Havre, showing positions of the original transatlantic station on the Quai d'Escale, the new Gare Joannès Couvert, and the Quai de Southampton for the cross-Channel service

The main building (656 yd. long × 50 yd. wide) is modern in style and conspicuous for its lofty clock tower at one end; it has three floors, the ground floor being devoted to outgoing goods traffic, the first to passengers, and the top floor to incoming goods. The building is divided into two identical sections, permitting the simultaneous handling of the traffic of arriving and departing liners. Behind this building is the railway station, consisting of two platforms and four platform roads enclosed under an arched roof. Footbridges at each end communicate with the passenger hall in the main building, and are reached from the platforms by escalators. Gangways with moving floors and adjustable to various deck heights give access from the hall to the vessels at the quay, and are reached through a barrier designed to facilitate the examination of passports. Corresponding improvements have been carried out in the arrangements for customs examination of disembarking passengers. Motorcars proceeding to the station reach the first floor direct by means of an inclined approach road from the Rue Mirabeau.

At the same time as the work described was being carried out, a line was built whereby boat trains connecting with Southampton—Le Havre steamers could run through to the Quai de Southampton, where these vessels berth. Passengers previously had to make their own way between Le Havre station and the quay.

Interior of the railway station, which, like the rest of the building, is of smooth surfaced ferro-concrete construction



New bridge at Durham Street, spanning Victoria station, Belfast, G.N.R. (Ireland), for which Harland & Wolff Limited undertook the fabrication and erection of the steelwork. The new steelwork, weighing approximately 300 tons, was erected in about 30 hours; all work was done during the night to avoid dislocation of railway traffic. The bridge consists of three spans of 42 ft., 57 ft. in centre, and 47 ft. 9 in. respectively, and the width is 65 ft. overall. The pier girders, each fabricated in one piece and weighing about 30 tons, are parallel to the station platforms, and are supported on four steel columns each composed of six joists riveted together. These girders carry the roadway and parapet girders in the centre of the bridge; the ends are supported on reinforced concrete abutments

Night view of Benton station, L.N.E.R., near Newcastle-upon-Tyne, showing the new gas lighting installation supplied by the Newcastle-upon-Tyne and Gateshead Gas Company. It has been very favourably commented upon by train users

RAILWAY NEWS SECTION

PERSONAL

Among the 24 directors of the Bank of England elected on April 1, the following have been re-elected:—

Sir Alan Garrett Anderson, G.B.E., Director of the L.M.S.R.

Mr. Charles Jocelyn Hambro, Deputy Chairman of the G.W.R.

Sir Josiah Charles Stamp, G.C.B., G.B.E., D.Sc., Chairman and President of Executive of the L.M.S.R.

Mr. Walter Kennedy Whigham, Director of the L.N.E.R.

L.N.E.R. Staff Changes

The London & North Eastern Railway announces that the following appointments have been made:—

Mr. C. Danby, Acting District Engineer for Docks, Grimsby and Immingham, to be District Engineer for Docks, the Hartlepools and Middlesbrough, in succession to Mr. F. Appleyard, who has recently retired from the service under the age limit.

Mr. L. Preston, Chief Technical Assistant, Signal & Telegraph Engineer's office, Liverpool Street, to be Assistant Signal & Telegraph Engineer, Southern Area, in succession to Mr. C. Carslake, who has recently been appointed Signal & Telegraph Engineer, North Eastern Area.

C.P.R. Staff Changes

Mr. G. Saxon Jones, who for the past 26 years has been London City Agent of the Canadian Pacific Railway, has retired after 50 years' service with that railway.

Mr. J. H. Jones, who since 1903 has been in the Freight Department, has been appointed to succeed Mr. Saxon Jones.

Mr. R. J. Harden has been appointed London City Passenger Agent.

Mr. H. F. Mathews, General Manager, Canadian Pacific Hotel System, announces the following changes, effective April 1, in the Canadian Pacific Hotel Management:—

Mr. T. E. Chester, Manager, Hotel Vancouver, to be Assistant General Manager, C.P.R. Hotels in Western Canada, with offices in Winnipeg, succeeding Mr. A. E. Robertson, resigned.

Mr. Colin F. Pratt, Manager, Palliser Hotel, in Calgary, to be Manager, Hotel Vancouver, and.

Mr. W. J. Mylett to be Manager, Palliser Hotel.

Great Southern (Ireland) Railway Staff Changes

The retirement is announced of Mr. Stephan Houlihan, Stationmaster at Kingsbridge, Dublin, after 52 years' railway service, of which the last eighteen years have been spent at Kingsbridge. Mr. Houlihan joined the former Waterford & Limerick Railway as a clerk, in 1884, and passing through different grades of the clerical staff was appointed to be the first Stationmaster at Tubbercurry, on the extension of the line between Claremorris and Sligo in 1895. Promotion followed in due course to Cahir, Ennis and Clonmel, from which station he was promoted to Kingsbridge in 1918. Mr. Houlihan was extremely popular with the travelling public and still appears to be in a robust state of health.

Mr. P. J. Forde, Stationmaster, Westland Row, Dublin, has been selected to fill the vacancy at Kingsbridge, caused by the retirement of Mr. Houlihan.

He joined the former Midland Great Western Railway as a clerk at Mullingar in 1905, and, having served in various clerical capacities at different stations, was subsequently appointed Chief Clerk at the North Wall goods depot, becoming Stationmaster first at Broadstone in 1927, and three years later at Westland Row.

Mr. E. Beglan, Stationmaster, Broadstone, has been selected for promotion as Stationmaster, Westland Row, vice Mr. Forde. He has 35 years' service and has held clerical positions at various stations, later becoming relief clerk and stationmaster.

We regret to record the death, on April 1, of the Rt. Hon. Lord Deramore, Chairman of the Derwent Valley (Light) Railway, at the age of 79. He was also Chairman of the Aire and Calder Navigation, and had been Chairman of the East Riding County Council for many years and since 1924 Lord Lieutenant of that Riding.

We regret to note the recent death of a former President of the Hungarian State Railways, State Secretary Kornel von Tolnay, at the age of 71. He was born at Gödöllö in 1865 and entered the Civil Service in 1894. In 1898 he became Assistant Traffic Superintendent on the State Railways, and soon afterwards Divisional Traffic Superintendent, first at Dehrecen and then at Budapest. Subsequently he was in private business for some years, but shortly before the war, was appointed General Manager of the Hungarian State Railways. The war put an end to the development schemes he intended to carry out, and after it he was appointed President of the National Industrial Union. President von Tolnay was actively concerned in founding the Mitropa sleeping and restaurant car undertaking.

It is with regret that we note the death on March 31 of Sir Joseph Ernest Petavel, D.Sc., F.R.S., Director of the National Physical Laboratory. During his 17 years' directorship, some of the activities of the laboratory most closely touching railway work have been the installation of two wind tunnels used for testing streamlining, ship tanks and electrical testing plant. Born in 1873 and trained at University College, London, Sir Joseph was for some time Professor of Engineering at Manchester University. Latterly he was connected with most research bodies.

The King has granted his patronage to the Travel and Industrial Development Association of Great Britain and Ireland. His Majesty was Patron of the association when Prince of Wales.

The funeral of Mr. A. S. Pearson, Assistant Goods Manager, York, L.N.E.R., whose death we announced on page 669 of last week's issue, took place at York cemetery, on April 1. Among those present were:—

Messrs. T. Hornsby, Divisional General Manager; C. M. Jenkin Jones, Superintendent; P. Gibb, Goods Manager; S. T. Burgoyne, Passenger Manager; A. Collinson, Assistant Superintendent; T. F. Cameron and W. W. Masser, Assistants to Div. General Manager; A. Cameron, District Engineer; A. Brown, J. E. Kitching, K. P. Walker, W. E. Blakey and E. V. Taylor, District Goods Managers; F. Graveson, former Assistant to Div. General Manager; A. A. Ryan, Hotels Superintendent; and Dr. J. G. McBride, Medical Officer, all of the North Eastern Area, the Accountant, Engineer, Locomotive Running Superintendent and Chief of Police of which were also represented.

Mr. Donald Moir, M.Inst.C.E., has been elected a Director of the Great Western of Brazil Railway.

Indian Railway Staff Changes

Mr. E. B. Francis, Superintendent of Stores, A.-B.R., has been granted leave as from February 12, and Mr. W. C. Blake has been appointed to act in his place.

Mr. W. H. Prendergast, Deputy Agent, A.-B.R., has been granted leave as from March 3: Mr. E. A. Cole, has been appointed to act for him during his absence.

Mr. V. C. Sandys has been confirmed as Deputy Chief Commercial Manager, E.I.R., as from April 1.

Mr. H. K. Bostock, Superintendent of Motive Power, Nigerian Railways, is home on leave. Also Mr. H. E. Allwood, Chief Mechanical Engineer of the Sierra Leone Government Railways.

It is with regret that we note the recent death of Mr. Alexander Mitchell, sometime Surveyor to the former Taff Vale Railway.

At the conclusion of a recent meeting of the Metropolitan Conference of Railway Companies with their Lighterage Agents, Mr. W. A. Brown, London District Freight Superintendent of the

Southern Railway, was presented with two easy chairs by the members of the conference and the Lighterage Agents to mark the occasion of his retirement on March 31, 1936. The presentation was made by Mr. A. S. Mills, London District Goods Manager, G.W.R., who stated that during the years that Mr. Brown had been a member of the conference his services had been greatly appreciated not only for his ability in dealing with business matters but also for the tactful and pleasant manner which he had displayed on all occasions.

Mr. Mills on behalf of the conference and the Lighterage Agents asked Mr. Brown to accept the gift not only as a memento of his association with the conference, but also as a token of their esteem and regard, and with their best wishes for the future years of his retirement. Mr. Brown suitably replied.

L.M.S.R. Appointments

The following appointments have been approved by the directors :—

Chief Commercial and Chief Operating Managers' Departments

Mr. L. C. Brittlebank, Assistant District Goods Manager, Broad Street, to be District Goods and Passenger Manager, Chester.

Mr. G. W. Galloway, Assistant to District Goods and Passenger Manager, Northampton, to be Assistant District Goods Manager, Broad Street.

Mr. W. B. Carter, Assistant to District Goods and Passenger Manager, Sheffield, to be Assistant to District Goods and Passenger Manager, Northampton.

Mr. W. A. Norris, Goods Agent, Bradford (Valley), to be Assistant to District Goods and Passenger Manager, Sheffield.

Mr. F. H. Taylor, Goods Agent, Rochdale, to be Goods Agent, Bradford (Valley).

Mr. J. Walkden, Head of Section (Goods Station Working), Chief Operating Manager's office, Euston, to be Goods Agent, Hinckley.

Mr. T. J. Knibbs, Goods Agent, Waterfoot, to be Goods Agent, Bury.

Chief Commercial Manager's Department

Mr. W. H. Tinsley, Agent, St. Malo (France), to be Agent, Barcelona (Spain).

Chief Operating Manager's Department

Mr. T. Follows, District Locomotive Superintendent, Swansea, to be District Locomotive Superintendent, Sheffield.

Mr. W. H. Ensor, District Locomotive Superintendent, Chester, to be District Locomotive Superintendent, Swansea.

Mr. H. Rihll, District Locomotive Superintendent, Plaistow, to be District Locomotive Superintendent, Chester.

Mr. J. E. Wood, Assistant, Office of Divisional Superintendent of Operation, Derby, to be District Locomotive Superintendent, Plaistow.

Scottish Change

Mr. T. C. Copland, Draughtsman, Marine Department, Heysham Harbour, to be Marine Engineer, Gourock.

The Institute of Transport Dinner

There was a record attendance at the annual dinner of the Institute of Transport which was held at the Connaught Rooms on April 3. Sir Cyril Hurcomb, the President of the Institute, was in the chair and before proposing the Loyal toasts, he announced, amidst applause, that His Majesty The King had been pleased to grant his Patronage to the Institute. His late Majesty King George V had been Patron since the incorporation of the Institute by Royal Charter in 1926.

Among those present were :—

Messrs. J. Abady, A. W. Arthurton, A. L. Barber, Sir E. Barber, T. Barty, P. F. Bennett (*President, Society of Motor Manufacturers and Traders*), H. V. Bishop (*President, Furniture Warehousemen and Removers' Association*), Sir Charles Bressey, F. G. Bristow, J. F. Brook, Sir J. R. Brooke, A. S. Cardew, H. M. Cleminson, A. R. Cooper, Lt.-Col. F. A. Cortez-Leigh, Major H. E. Crawford, Dr. Brysson Cunningham, W. H. Curtis.

B. O. Davies (*President, Institute of Chartered Shipbrokers*), G. Cole Deacon, G. H. Hare Dean, A. M. Dennis, Major J. B. Elliott (*Chairman, Associated Road Operators*), G. Ellson, N. D. Fawkner, Sidney E. Garcke (*Past President*), W. H. Gaunt, Sir Alexander Gibb, the Rt. Hon. Viscount Goschen, W. S. Graff-Baker, A. Winter Gray (*Secretary, Institute of Transport*), H. N. Gresley (*President, Institution of Mechanical Engineers*), the Rt. Hon. Sir Arthur Griffith-Boscawen (*Chairman, Transport Advisory Council*).

A. E. Hammett, A. J. Hancock (*President, Institution of Automobile Engineers*), Sir Hugh Hannay, Rowand Harker, R. Helbronner, R. M. Holland-Martin, Sir Richard D. Holt (*President of the Dock and Harbour Authorities Association*), Sir George Humphreys, Sir Henry Jackson, W. A. Jepson, Col. A. Jerrett (*President, Commercial Motor Users' Association*), J. A. Kay, R. Kelso, J. M. Kennedy (*President, Institution of Electrical Engineers*), A. E. Kirkus, D. R. Lamb, L. J. Le Clair, F. Lydall, Brig.-Gen. Sir Osborne Mance, J. McDonnell, J. G. Merriweather, A. Morton, Lt.-Col. A. H. L. Mount.

Col. Sir Joseph Nall (*Past President*), J. S. Nicholl, Sir William Noble, E. E. Painter, Frank Pick (*Past President*), J. Pike, O. C. Power, W. H. J. Pyne, A. S. Quartermaine, Lt.-Col. F. Rayner (*President, Canal Association*), D. Ross-Johnson, Sir Francis Shelmerdine, C. E. R. Sherrington, Sir Charles Sherrington, H. A. Short, E. S. Shrapnell-Smith, Roger T. Smith (*Past President*), Sir Josiah Stamp (*Past President*), G. S. Szlumper, T. E. Thomas, Col. A. H. C. Trench, Sir George Truscott, J. D. Watson (*President, Institution of Civil Engineers*), W. V. Wood.

The Rt. Hon. Lord Essendon, Chairman of Furness, Withy & Co. Ltd., and other prominent shipping companies, proposed the toast of "The Institute of Transport." After a humorous reference to Belisha Beacons, he said that if Mr. Hore-Belisha could find something which would save money in the shipping industry as he was saving life on the roads, it would be grateful to him. Referring to the growth of motor transport for the carriage of goods, Lord Essendon pointed out that this had been a disturbing factor to coastwise shipping as well as to the railways. There were some who doubted whether the extent of the development had been to the public advantage but, like the newest branch of transport—air transport—it had established itself and should be allowed to take its proper place in the carrying trade of the country provided it was not enabled to affect unfairly the maintenance and development of other forms of transport. The coastwise shipping industry had made it clear that it welcomed co-operation with other branches of transport and it could be relied upon to respond wholeheartedly to the request of the Transport Advisory Council for constructive suggestions. The industry had been interested to note that large sums of money were to be spent on the roads and the railways and it was anxious that in the spending of those monies, attention should be given to the facilities at the ports which were the terminals of its ships.

Sir Cyril Hurcomb, the President, replied to the toast and, in doing so, gave some account of the progress of the Institute during the past year. The membership, he said, was approaching 5,000 and he congratulated and thanked those responsible for the conduct of the Centres Abroad, the Local Sections, and the Graduate and Student Societies. It was evidence of the importance of and the interest taken in the South Africa and New South Wales Centres, that Mr. T. H. Watermeyer, the General Manager of the South African Railways and Harbours, was the Chairman of the first mentioned, and Col. M. F. Bruxner, the Minister of Transport of New South Wales, was Chairman of the latter. Continuing, Sir Cyril Hurcomb spoke of the work of the Ministry of Transport and said that although the Ministry had no wish to be meddlesome, it had had to make a number of rules and regulations because it was not practicable to allow anyone to take a vehicle of any size and description upon the road and behave as he liked when he got there. New and telling methods of propaganda had been found for the education of all road users and for his work in this respect they must be forever grateful to Mr. Hore-Belisha.

Col. Sir Joseph Nall, M.P. (Past President) proposed "Our Guests" and in the course of his speech referred to the transition of the smoke-driven train to the electric train which, he said, is coming surely, if somewhat slowly.

The Rt. Hon. L. Hore-Belisha, M.P., the Minister of Transport, who replied for the guests, paid a warm tribute to the President whom he humorously spoke of as his headmaster. His zeal and enthusiasm, he said, had been an inspiration to his predecessors and to himself. The Minister understood that he was now becoming one of the elder statesmen. At the time when some of the leading Japanese ministers were shot, Mr. Amery had been discussing with his chauffeur this method of disposing of elder statesmen. "I wish we could do that here, sir," the chauffeur said, and when asked with whom he would start, he replied, "Mr. Hore-Belisha."

The dinner was followed by a dance.

Preparation of Track for Fast Running

How the permanent way department of the Chicago, Milwaukee, St. Paul & Pacific Railroad adjusted its track in preparation for new high speed traffic including the Hiawatha streamlined steam train, is described in the January number of the *Quarterly Technical Bulletin* issued by the Indian Railway Board.

For the run of 410 miles from Chicago to St. Paul the schedule is 6½ hours, which involves long distances being covered at speeds of 80 to 90 m.p.h. Track which is built for 50 to 60 m.p.h. may be uncomfortable and even dangerous at these higher speeds, and therefore a comprehensive programme of adjustments has been carried out. This involved an examination in which the curvature, superelevation and spiralling of all curves were checked.

Generally speaking, the gradients were easy, only a few cases occurring in which it was more than 0·7 per cent. (1 in 143), and the curves were usually flat. In only one place was it found necessary to divert the track, but in several cases it was possible to reduce the curvature considerably.

It was decided to superelevate all curves flatter than 2 degrees (43½ ch. rad.) a sufficient amount for comfortable riding at 90 m.p.h. and to give curves of 2 degrees and sharper the maximum of 3½ in., suitable speed restrictions being imposed. The importance of transition curves was realised and use was made of the spiral developed by the track committee of the A.R.E.A. The rate of run-off selected was ½ in. in 39 ft., with the spiral of such length that no preliminary cant would be necessary on the straight. As most of the curves between Milwaukee and La Crosse had no transitions, their insertion often produced at the end of the circular curve throws of 12 in., and occasionally as much as 16 in., but in all cases the slue through the main curve was less.

To carry out the work, three general parties were sent into the field. The first was divided into two groups, one to each track. They measured the mid-ordinates of consecutive 39-ft. chords, recording them on specially prepared cards, and also noted other data affecting re-alignment. Immediately they had completed a curve, the cards were sent to the office, where corrected ordinates and details were computed and sent to the second party, who pegged out the new line. The cards were then passed to the third party who checked the peg positions and clearances at all controlling points.

The setting out of the end of the transition next the tangent was generally done by means of a theodolite, as it was found more satisfactory. This was due to the relative inaccuracy of the string-line method for small measurements, caused by the original curve having been extended gradually into the straight to ease the running over poor transitions or entrances to curves with no transitions.

When the adjustments were being carried out, all curves were raised an average of one inch, with an additional increase under the high rail where necessary. A force of 475 men in extra gangs and about 125 section men were employed for 2 months, the latter doing chiefly light surfacing work. All the larger gangs were fully mechanised.

As the result of this work, full speed is allowed on curves of one deg. and less, 70 m.p.h. for those up to and including 2 deg., and 60 m.p.h. or less on sharper curves. All restrictions are carefully marked by warning boards and finishing boards, so that drivers have visual reminders.

Steam Locomotive Stock, British Main Line Railways, 1934 and 1935

(*See editorial note on page* 691)

Wheel arrangements	L.M.S.R.		L.N.E.R.		G.W.R.		S.R.		Total	
	1935	1934	1935	1934	1935	1934	1935	1934	1935	1934
Tender										
4-2-2	—	1	—	—	—	—	—	—	—	1
2-4-0	30	31	34	44	8	11	—	—	72	86
0-4-2	—	—	—	—	—	—	43	46	43	46
4-4-0	890	933	759	786	147	162	452	460	2,248	2,341
4-4-2	—	—	229	235	—	—	11	11	240	246
0-6-0	2,455	2,536	1,932	1,964	260	271	273	276	4,920	5,047
2-6-0	298	301	234	207	388	403	174	174	1,094	1,085
4-6-0	828	776	327	322	377	356	166	162	1,698	1,616
4-6-2	13	2	88	83	—	—	—	—	101	85
4-6-4	—	—	1	1	—	—	—	—	1	1
0-8-0	801	827	312	318	—	—	—	—	1,113	1,145
2-8-0	23	11	483	483	143	143	—	—	649	637
2-8-2	—	—	4	4	—	—	—	—	4	4
0-10-0	1	1	—	—	—	—	—	—	1	1
Total ...	5,339	5,419	4,403	4,447	1,323	1,346	1,119	1,129	12,184	12,341
Tank										
2-2-4	—	—	2	2	—	—	—	—	2	2
0-4-0	72	80	104	104	21	22	29	29	226	235
2-4-0	3	3	—	—	44	48	3	3	50	54
0-4-2	7	7	4	4	112	101	58	60	181	172
2-4-2	344	354	199	216	—	—	—	1	543	571
4-4-0	2	4	—	—	—	—	—	—	2	4
0-4-4	258	281	135	137	—	—	317	320	710	738
4-4-2	105	118	163	163	—	3	60	61	328	345
4-4-4	—	—	12	24	—	—	—	—	12	24
0-6-0	1,004	1,016	866	875	1,061	1,071	130	131	3,061	3,093
0-6-2	240	256	691	699	424	428	145	145	1,500	1,528
2-6-2	144	70	50	29	412	392	—	4	606	495
0-6-4	37	52	9	9	—	—	5	5	51	66
2-6-4	171	164	20	20	—	—	12	5	203	189
4-6-2	59	59	107	95	—	—	7	7	173	161
4-6-4	13	20	—	—	—	—	2	6	15	26
0-8-0	3	4	—	—	—	—	9	9	12	13
2-8-0	—	—	—	—	160	175	—	—	160	175
0-8-2	21	26	—	—	1	2	—	—	22	28
2-8-2	—	—	—	—	35	20	—	—	35	20
4-8-0	—	—	15	15	—	—	4	4	19	19
0-8-4	30	30	6	6	—	—	—	—	36	36
*2-6-6-2	33	33	—	—	—	—	—	—	33	33
*2-8-8-2	—	—	1	1	—	—	—	—	1	1
Total ...	2,546	2,577	2,384	2,399	2,270	2,262	781	790	7,981	8,028
Total Tender and Tank	7,885	7,996	6,787	6,846	3,593	3,608	1,900	1,919	20,165	20,369

* Garratt articulated locomotives

BARRONIA METALS LIMITED NEW PREMISES.—Barronia Metals Limited has moved to new premises at Power Road, Gunnersbury, W.4 (Tel. Chiswick 6470), where the offices and works are now situated. The opportunity has been taken to install the latest types of equipment, including six oil-fired furnaces capable of melting 9,000 lb. of non-ferrous alloys per 8-hr. shift. A machine and fitting shop has been provided to meet the demand for finished parts to customers' specifications, and modernised laboratories will assist the firm, which for some 15 years has been concerned with the production of high-duty bronzes, in its metallurgical research work.

London Transport Bills

As briefly mentioned last week the case for the railway works comprised in the joint scheme of London Transport improvement in which the London Transport Board and the London & North Eastern and Great Western Railway Companies are concerned, was continued on March 26 before a Select Committee of the House of Commons presided over by Sir Henry Cautley. The evidence of Mr. Frank Pick, Vice-Chairman of the London Passenger Transport Board, who had explained the whole scheme in detail, was concluded.

Sir Ralph Wedgwood, Chief General Manager of the London & North Eastern Railway, said that the difficulties of providing adequate transport facilities through Stratford to the east and through Finsbury Park to the north had been the concern of his company ever since its formation in 1923. The company had given attention to several alternative schemes of electrification. There were three difficulties in the way. The first was the high cost and the inadequacy of the return on the money according to all the estimates of the traffic which they could make. The second was the uncertainty whether even that return would be maintained in view of the competition between the different methods of transport which existed until the formation of the pool under the London Passenger Transport Act of 1933. The remaining difficulty was the rate of interest which would have to be paid on money raised in the open market, but that had been met by the conditions of the Government guaranteed loan. It was now a matter of equal interest to his company whether the redistribution of traffic under the scheme resulted in a greater loading of the tubes or of the surface lines, so long as there was accommodation available for the extra service. Mr. Pick had estimated that £6,477,000 was the sum which the L.N.E.R. might be required to borrow under the scheme. His company would still have an interest in the line from Leyton to Loughton, but only in respect to the working of goods and parcels traffic. Under the agreement with the Finance Corporation his company would pay, he thought, a little under 3 per cent.

Sir James Milne, General Manager of the Great Western Railway, said that the western part of the scheme involved the construction of two tracks from North Acton to Ruislip, alongside a line which was owned by his company up to Northolt Junction. Beyond, it belonged to the Great Western and London & North Eastern Companies jointly. His company would expend £1,655,000 on the scheme. The new line would be worked entirely by the London Passenger Transport Board, which would provide the rolling stock at an expenditure of about £480,000.

Mr. David Anderson, a member of the firm of Mott, Hay & Anderson, Consulting Engineers to the London Passenger Transport Board along with Sir Harley Dalrymple Hay, explained the engineering details connected with the extension of the Central London Railway from Liverpool Street out to Ilford. From Liverpool Street the usual tube railway construction would be adopted, through Bethnal Green to Mile End Road. At Bethnal Green there would be an ordinary tube station, but at Mile End the line would rise somewhat from the deeper level, in order to make a platform interchange station with the District Railway. Thence the tube line would be carried under the L.N.E.R. main line until at Stratford it would come to the surface to make a large interchange station giving platform interchange with the L.N.E.R. station. The line would be carried thence in tube until it rose up to the surface lines of the L.N.E.R. at Leyton station. From thence the existing works would be used for about a mile to Leytonstone station. North of that station the railway would again be in tube with a tube station at George Green. In continuing the line from that point it was originally intended to come to the surface at Red House, but in order to meet certain objections and the risk of flooding from the River Roding they were making it a shallow railway with a shallow station at Red House, and going under instead of over the Roding. Then they went directly east as a tube railway to Ilford North, where there would be a tube station. Carrying on further they would come up to the surface in order to make a junction with the L.N.E.R. at Newbury Park station. The total length of the new railways in this part of the scheme was nearly 9½ miles.

Mr. Anderson then dealt with other proposed works on the Central London Railway. Most of the station platforms between Shepherd's Bush and Liverpool Street had at present a length of 325 ft. In order to take the longer trains that the L.P.T.B. required they had to lengthen the station tunnels by approximately 100 ft. Work of this kind had already been done at Chancery Lane and Holborn. Another matter was the realignment of the tunnels at certain points in order to give the necessary clearance for the new standard rolling stock which was to be used.

Sir Harley Dalrymple Hay said he was the engineer for the Section which included the railway connecting the Highgate tube with the East Finchley line of the L.N.E.R. There were also various works on the Baker Street and Waterloo line where platforms had to be lengthened. There was no engineering difficulty with any of these works.

Mr. C. J. Brown, Civil Engineer, Southern Area, L.N.E.R., and Mr. Raymond Carpmael, Civil Engineer, Great Western Railway, gave formal evidence on March 27 as to the lay out of works in the L.N.E.R. (London Transport) and the G.W.R. (Ealing and Shepherd's Bush Railway Extension) Bills, respectively.

Major Matheson, of the Ministry of Transport, who attended at the request of the Committee, dealt with the question of eliminating five level crossings on the L.N.E.R. lines in North-East London which it is proposed to electrify. These five crossings are at Grove Green Road, Eagle Lane, George Lane, Snakes Lane, and Theydon Bois. Major Matheson said the Ministry of Transport had given a binding promise that the net cost of the works involved in eliminating these level crossings, including the cost of acquiring the necessary property, would be borne as to 75 per cent. by the Road Fund, conditionally upon the L.P.T.B. providing 12½ per cent. of such cost, and the interested highway authorities the balance. The improvement of the bridge carrying the railway over High Street, Wanstead, at Snaresbrook station would be included in the financial arrangements.

After further discussion the Chairman said that the Committee found the preambles of the three Bills (so far as concerned the railway proposals in them) proved, subject to the condition that on the Loughton line the level crossings were to be made into bridges, and that the bridge at Snaresbrook was to be widened and heightened to the satisfaction of the parties and of the Ministry of Transport before electric trains began to run.

South African Railways Budget Speech

A decision to reduce harbour charges was announced by Mr. Pirow, Minister of Defence, Railways, and Harbours, introducing his railway budget in the House of Assembly. By so doing it is hoped to encourage ships diverted from the Suez Canal, as a result of the Italo-Abyssinian trouble, to continue using the Union harbours even after the trouble has blown over.

The budget shows a surplus of £3,128,188. Other purposes for which this surplus will be utilised will be concessions to the travelling public and the refunding of cuts in staff salaries which were made during the depression.

Mr. Pirow foreshadowed the possibility of the establishment of a Ministry of Transport. Outlining development in air services, he said that by February, 1937, the Union services would be operating, in conjunction with Rhodesia-Nyasaland airways, as far north as Lusaka (Northern Rhodesia). By that time, too, the Imperial Airways flying-boat service would, he anticipated, have reduced the distance between Durban and London to 4½ days and under.

NOTES AND NEWS

Fares on the U.S.A. Eastern Lines.—The leading Eastern railway companies in the United States have finally decided to request the Interstate Commerce Commission to postpone the effective date of its order regarding a reduction in passenger fares, to which frequent reference has recently been made lately in our Overseas columns. In the interim the carrying concerns would experiment with fares lower than the existing rates, but higher than those provided for by the commission.

Easingwold Railway Meeting.—At the recent annual meeting of the Easingwold Railway Company, held at Easingwold, Mr. R. E. Smith presided. The accounts for the year ended December 31, 1935, showed a continued loss on the working owing to the excessive road transport. The hope was expressed that the farmers and traders would see their way to give more local support to the railway as specially low rates had been put into operation for agricultural traffic.

Canadian Pacific Earnings.—Gross earnings of the Canadian Pacific Railway for the month of February, 1936, amounted to $9,281,000, an increase of $625,000 in comparison with February, 1935. In the working expenses of $8,414,000 there was an increase of $608,000, leaving net earnings $17,000 higher, at $867,000. For the first two months of 1936 gross earnings were $18,605,000, an increase of $1,682,000, and net earnings $1,480,000, an increase of $426,000.

Canadian National Earnings.—For the month of February, 1936, gross earnings of the Canadian National Railways amounted to $13,066,507, an increase of $644,701 in comparison with February, 1935. Operating expenses ($13,354,967) advanced by $1,065,729, leaving a deficit of $288,460, against net earnings of $132,567. Aggregate gross earnings for January and February, 1936, were $25,809,061, an improvement of $1,279,669, but there was an aggregate deficit on working of $864,791, which compares with one of $613,786 for the first two months of 1935.

L.M.S.R. Manchester Dinner.—The annual dinner of the Commercial Department, District Goods Manager's Office, L.M.S.R., Manchester, was held on March 16, at the Midland Hotel, Manchester, under the chairmanship of Mr. H. G. Humphreys, the District Goods Manager, and was attended by some 200 of the principal business men of Manchester, Salford and district. Mr. H. G. Humphreys proposed the toast of "the guests," and thanked them for their support of the L.M.S.R. throughout the year. Lt.-Col. T. H. G. Stevens, of Trafford Park Estates Limited, responded. Mr. V. Z. de Ferranti, in proposing the toast of the London Midland & Scottish Railway Company, hoped that soon the railway companies would be running their clean electrified trains through the country. Mr. Ashton Davies, Chief Commercial Manager of the L.M.S.R., replied.

Cinemas on U.S.A. Trains.—Experiments with several types of apparatus are being conducted in the U.S.A. by the Pullman Company with a view to installing motion pictures in club and observation cars on trains. Discussions are also under way between the Pullman company and various film-renting companies for the supply of films. Cinemas have been a feature on the *de luxe* trains of one or two southern U.S.A. lines for the past year, notably trains taking holiday-makers to Florida coast resorts.

Railway Officers at Cambridge University Railway Club.—Three railway officers lectured to the Cambridge University Railway Club during the Lent term. They were Mr. H. F. Sanderson, District Superintendent, Cambridge, L.N.E.R., who lectured on "Automatic and Colour-Light Signalling"; Mr. B. P. Fletcher, District Engineer, Cambridge, L.N.E.R., whose subject was "The Renewal of Railway Bridges"; and Mr. C. Grasemann, Public Relations Officer of the Southern Railway, who illustrated a talk on staff training by showing some of the instructional films used by the company for this purpose.

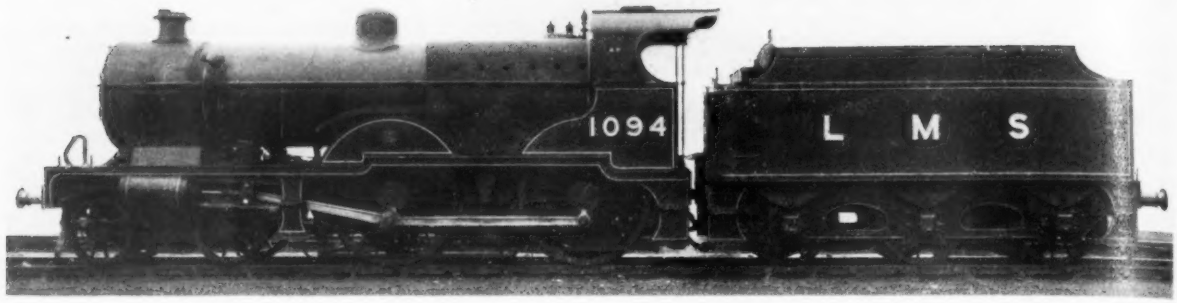
Redundant Transport Services.—Mr. W. A. Winson, Chairman and Managing Director of S.P.D. Limited, read a paper on "Elimination of Waste Movement the Key to Efficient Transport" to the Glasgow Railway Lecture and Debating Society on February 13, and criticised various competitive elements remaining in supposedly co-ordinated facilities. The pooling of main-line receipts, for example, still gave the advantage to the company which actually secured any given traffic, and this, Mr. Winson claimed, induced the railways to maintain duplicated facilities which were a source of national waste. He also alleged that transport agencies were more interested in keeping consignments in their own hands as long as possible than in securing their early delivery by making the most efficient use of co-ordinated services.

Stainless Steel Car on the Santa Fé.—The Santa Fé Railway (U.S.A.) has introduced a standard-size 52-seat stainless steel *de luxe* chair carriage which embodies many lightweight structural features. It is a self-contained unit and therefore capable of being included in any train make-up. Riding comfort is secured by the low centre of gravity; the car weighs 83,000 lb. of which the two four-wheel bogies account for 30,000 lb. A comparable conventional Santa Fé coach weighs 160,000 lb. and seats 80 passengers. In the new vehicle the smaller seating capacity allows for a smoking lounge with leather upholstered seats, and a dressing room for women. Full air-conditioning is provided. The coach was built by the Edward G. Budd Manufacturing Company at Philadelphia.

Harwich-Zeebrugge Steamship Service.—The L.N.E.R. announces that the Harwich-Zeebrugge service will be put into operation on June 26, and will be maintained daily, including Sundays, by the ss. *Archangel* and *St. Denis*. Passengers will leave London (Liverpool Street) at 8.15 p.m. for Zeebrugge, and Zeebrugge at 11 p.m. for London.

French Railway Bonuses.—Four of the great French railway companies are proposing bonus payments to shareholders, states *The Financial Times*. The Nord proposes a dividend for 1935 of fr. 70 gross per capital share and fr. 54 per *action de jouissance* and a free bonus of one fr. 1,000 4 per cent. debenture, 1921 type, to each holder of two capital shares or two *actions de jouissance*. The Est is proposing a dividend of fr. 52 gross per *action de jouissance* and a free bonus of a new 3 per cent. debenture to each holder of three capital shares or three *actions de jouissance*. The P.L.M. is recommending a dividend of fr. 55 on the capital shares and of fr. 35 on the *actions de jouissance*. In addition, it is to distribute as a bonus fr. 20 per share out of the private investment resources, making a gross dividend of fr. 75 and of fr. 55, respectively. The Paris-Orleans is also adding a few francs to the usual State-guaranteed dividend, so that the capital shares will get a total gross dividend of fr. 68 and the *actions de jouissance* a gross dividend of fr. 53.

The Shrivenham Accident, G.W.R.—The fourth fatal passenger train accident on the Great Western Railway in a period of over 30 years occurred in the early morning of January 15 last, near Shrivenham station, when a Penzance express collided at speed with some wagons standing on the main line outside the home signal. The wagons had become detached from a coal train, through breakage of a coupling. Lt.-Col. A. H. L. Mount's report has just been issued, and reveals the primary cause to have been the breakage mentioned, but the main subsidiary one to have been the failure of two signalmen to notice the absence of tail lights on the coal train, the guard of which is also not exonerated from responsibility. He had ample time, had he been on the alert and realised what had happened, to have gone back and placed detonators on the line to protect the detached vehicles. The irregular working of the clocks in the cabins concerned is commented on. Col. Mount remarks that continuous track circuiting provides the only real safeguard against this kind of accident, but he considers that the policy of installing it locally is the correct one in present circumstances. He also points out that the number of failures of goods train couplings tends to fall. Though it is still over 3,000 a



All new L.M.S.R. locomotives are to have a new style of numbering and lettering as shown above, whereby the engine numbers, classification numbers on cab-sides, initials "L.M.S." and the numbers on the smokebox will be in plain block style instead of in roman characters. The letters and numbers will be in gilt, with black shading for red-painted passenger engines, and with red shading for black-painted passenger engines. On freight engines painted black, the characters will be plain block in gilt, without any shading

year on actual goods train operation. Col. Mount suggests the tightening up of the existing R.C.H. regulations in order reasonably to ensure that within an agreed period a weak wrought iron drawhook, such as that which failed at Shrivenham, will not be in service, and that annealing or normalising will also be included in future as an additional requirement of a general repair, preparatory to plating as a condition of continued user. A summary of Col. Mount's report will appear in an early issue of THE RAILWAY GAZETTE.

Railways Athletic Association.—The annual five-mile cross-country race took place from the Royal Air Force Depot, Ruislip, on Saturday, March 21. The following were the results: The Individual Championship was won by H. D. Clark (L.N.E.R., York), with D. E. Phillips (G.W.R., Newport) second, and S. Shirley (London Transport, District Line) third. In the Railway Group Championship the L.M.S.R. defeated the L.N.E.R. by one point. The Provincial Championship was won by the L.N.E.R. (York), followed by the L.M.S.R. (Crewe), and the London Area Championship by the L.M.S.R. (Cricklewood), with the S.R. (Croydon) second. The winner of Sir Herbert Walker's Silver Challenge Cup awarded to the first Southern Railway competitor finishing in the race was R. Gooden, Carriage and Wagon Department, Eastleigh. Mr. R. M. T. Richards (S.R.) officiated as starter, and amongst those present to witness the event were Mr. and Mrs. J. S. Anderson, and Major R. F. Morkill (London Transport), and Messrs. A. E. Hammett and J. S. Wilson (S.R.).

CONTRACTS AND TENDERS

The Egyptian State Railways Administration has placed an order with the English Steel Corporation Limited, Sheffield, for locomotive tyres. The value of the contract is £3,315.

The Indian Stores Department is calling for tenders, to be presented in Simla by April 28, for the supply of 3,000 screw couplings. Further particulars may be obtained from the Department of Overseas Trade.

The Controller of Stores, Eastern Bengal Railway, is calling for tenders, to be presented in Calcutta by May 15, for the supply of locomotive boilers, cylinders and motion sets. Further particulars may be obtained from the Department of Overseas Trade.

The Western S.M.T. Co. Ltd. has placed an order for a further 25 oil-engined double-deck buses, complete with 52-seater Hybridge bodies, with Leyland Motors Limited. Eighty-five chassis of the new Cheetah model have recently been delivered to this Scottish group, which still has nearly 200 Leyland chassis on order.

The Central Uruguay Railway has placed an order, to the inspection of Messrs. Livesey & Henderson, with Nicaise et Delcuve, of Belgium, for 15 wagon underframes.

The Egyptian Ministry of Finance is calling for tenders, to be presented in Giza by May 16, for the supply of new or second-hand rails and angle irons. Further particulars may be obtained from the Department of Overseas Trade.

The Egyptian State Railways Administration is inviting tenders, through the Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1, for the following (the closing dates are given where fixed):—

Two machine tools at an approximate cost of £E600 (May 16).

Mild steel plates required during one year at an approximate cost of £E3,600 to £E3,600 (April 30).

Mild steel angles, required during one year, at an approximate cost of £E600 to £E750 (April 29).

41,500 bolts and nuts, wrought iron, galvanised, comprising four different dimensions (May 12).

30 portable forges.

400 m. of low-tension copper cable.

20 km. cable, lead and cotton-covered.

Railway and Other Reports

Taltal Railway.—Consideration of the payment of a dividend is deferred until the results for the year to June 30 next are ascertained. For 1934-35 an interim dividend of 1 per cent. was declared and was followed by a final payment of 1 per cent.

Metropolitan Railway Assented Stock.—Glyn Mills & Co., the trustee and registrar under the trust deed relating to the Metropolitan assented stock constituted by the London Passenger Transport Act, 1933, announces that a distribution of 1 per cent. actual, less tax (on account of the interest for the year ending June 30, 1936), will be made to holders registered on March 31.

Snowdon Mountain Railway.—A net profit of £3,734 is shown for the year 1935. Adding £5,862 brought in makes a total of £9,596. The directors have recommended a dividend of 5 per cent. (the same as for 1934) which absorbs £3,500 and leaves £6,096 to be carried forward. They have disposed of the company's surplus land at Aberglaslyn to the National Trust.

Sharpness Docks & Gloucester & Birmingham Navigation Company.—Receipts for the year 1935 amounted to £108,723 (against £110,620 in 1934) and expenditure to £55,476 (against £55,726), leaving net receipts of £53,247, compared with £54,894. After providing £23,212 for debenture interest, £4,400 for reserve for redemption of debenture bonds, £50 for reserve for tug insurance, and £2,534 for works and contingencies reserve, there remains a balance for disposal of £23,051. Preference dividends absorb £16,975, and the directors recommend a dividend of 2 per cent. (less tax) on the consolidated ordinary stock, which requires £6,076.

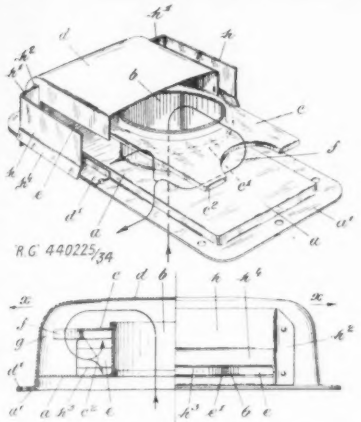
In view of the Easter holidays, this issue of THE RAILWAY GAZETTE *is published three days earlier than usual, and consequently the tables of British and foreign railway traffic returns are held over until next week.*

ABSTRACTS OF RECENT PATENTS*

No. 440,225. Improvements in Ventilators

Mead, McLean & Co. Ltd., of Grand Buildings, Trafalgar Square, London, W.C.2, and Albert Alfred Mead, of South Vale House, Blackheath, London, S.E.3. December 20, 1934.

A ventilator has an oblong base plate *a* dished to provide a flange a^1 along each of its four sides. In the plate *a*



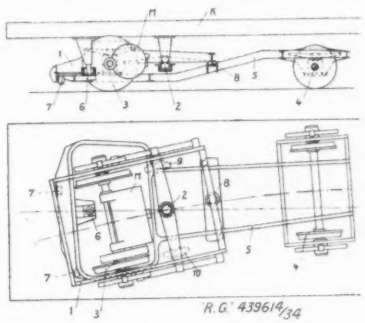
there is a central hole surrounded by an upstanding chimney *b*, a horizontal flange or plate *c* being fitted near its top. A bonnet *d*, having the same shape in plan as the base plate *a*, is placed upon the latter and attached to it by means of a flange d^1. The height of the chimney *b* is such that its top edge is within a short distance of the bonnet *d*, which is elevated for this purpose. Rectangular apertures *e* are formed along the lower side walls of the bonnet. The plate *c* is oblong and its width is slightly less, but its length much less, than that of the bonnet, so that a gap *g* is left at each end. In each end of the plate *c* a notch *f* may be formed so as to increase the area of the gap *g*. The plate *c* may be formed with a turned down flange c^2 along its side and end edges, which flanges serve as baffles for the ingress of solid and liquid matter. The apertures *e* extend along the greater part of the length of the bonnet, and their lower edges are about level with the base plate *a*. The apertures *e* are guarded over their whole length by side baffles or deflectors *h* formed of sheet metal strips. The end portions of the strips are bent to form end baffles or deflectors h^1 and attachment lugs h^2. The lower edge portions of the side baffles *h* are removed, so that their lower edges h^3 are a little above the level of the lower edges e^1 of the apertures *e*. The lower edge portions of the side baffles may be curved or bent outwardly to form lips h^4.

The ventilator will operate when the vehicle is travelling in either of the directions indicated by the arrows *x*. The current of air creates a reduced pressure between the side baffles and bonnet, and extraction of the foul air takes place up through the chimney *b* into the top space of the ventilator, down through the notches *f* and end gaps *g* and laterally outwards through the apertures *e*. The action is the same whether the air current over the ventilator is in the direction of the arrows *x* or at an angle to this direction, as when a cross wind passes over a stationary vehicle. — (*Accepted December* 23, 1935.)

No. 439,614. Improvements in Railway Vehicle Bogies

Schweizerische Industrie-Gesellschaft, of the Swiss Confederation of Neuhausen, Schaffhausen, Switzerland. (Convention date: April 17, 1934.)

A bogie assembly for a railway vehicle has a body K provided with two symmetrical bogies of identical construction. Each of the bogies has two radial axles, an inner flexible axle 4, and an outer flexible axle 3. The latter is mounted in a bogie frame 1, the former in a frame 5. The body K is supported by the bogie 1 by means of a pivot 2, which is mounted in a bearing or centre pin socket fixed to the bogie 1. The bogie 1 is also provided with lateral bearings 9, 10 for the body K, the inner end of this bogie is pivoted at 8 to the pole or radius bar of the bogie 5, which is designed as a bissel-truck. The joint 8 is disposed half-way between the two

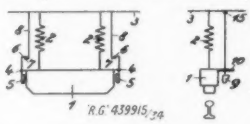


axles 3 and 4. The pole of bogie 5 reaches as far as the outer end of bogie frame 1 and is connected to the vehicle body by means of a pivot 6 allowing the latter longitudinal play. This joint is designed so that there is no transmission of load between the bogie frames 1 and 5 at that point. To this end the pivot 2 is arranged as near the outer axle 3 as possible, so that the axle load of this axle is much greater than that of the inner axle 4. The pole 5 is supported by the bogie frame 1 by means of bearing rollers 7. When travelling along a curve the pivot 6 fixed to the body K lies beyond the middle of the track. The middle of the inner flexible axle 4 then lies on the outer side of the longitudinal axis of the body K, and the bogie frame 5 is moved accordingly. As the frame 1 is pivoted to the frame 5 by the bearing 8, the movement of the frame 5 causes the frame 1 to revolve about the pivot 2, bringing the frame 1 into correct radial position. When travelling ahead the two flexible axles 3 and 4 run parallel, thereby preventing any irregular oscillating motion of the vehicle.— (*Accepted December* 10, 1935.)

No. 439,915. Improvements in Track Brake Magnets

Knorr Bremse A.G. Neue Bahnhofstrasse, Lichtenberg, Berlin. December 10, 1934. (*Convention date: France, September* 1, 1934.)

Track brake magnets have, in addition to the usual suspension, an additional suspension device independent



of the former. The track brake magnet 1 is suspended by means of the springs 2 on the truck frame 3 of the vehicle. At its ends are situated arms having pivot pins 4, about which turn levers 5. Each of the levers carries at its lower end an iron member influenced by the magnet 1, and at the upper end a hook 6, each hook 6 lying on the lower bent-over end 7 of a hook 8 secured to the truck frame 3 when the magnet is not excited. When one of the springs 2 breaks, the magnet is carried by the hook 8 and cannot fall down on to the rail. When the track brake magnet 1 is excited, its ends attract the iron members of the levers 5, and thereby interrupt the engagement of the hooks 6 in the bent-over ends 7 of the hooks 8; so that the magnet 1 can travel down on to the rail, the hooks 6 and 7 have inclined surfaces which slide on one another when engaging. In a further construction the magnet 1, suspended on springs, is provided with a lateral stirrup-shaped projection 10. A rod pivoted at the point 15 on the frame 3 has a pawl 9 which serves as an armature and which can engage below the centre part of the stirrup-shaped projection 10 when the magnet is not excited. Upon breakage of the spring 2, the part 10 lies on the part 9 and the magnet 1 is thus held fast. When the magnet is excited it attracts the armature 9 so that the stirrup 10 can pass the armature 9 and the magnet 1 can then travel down unhindered to

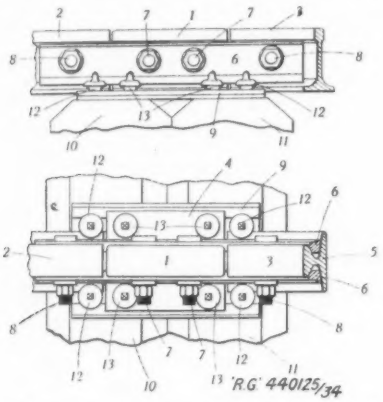
* These abridgments of recently published specifications are specially compiled for THE RAILWAY GAZETTE by permission of the Controller of His Majesty's Stationery Office. Group abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2 either sheet by sheet as issued, on payment of a subscription of 5s. a group volume, or in bound volumes, price 2s. each, and the full specifications can be obtained from the same address price 1s. each.

the rail. The parts 9 and 10 have inclined surfaces to facilitate their re-engagement.—(*Accepted December* 17, 1935.)

No. 440,125. Rail Joint

Waclaw Jacyna, of 12 *m.b.M., Elsterska, Warsaw, Poland. August* 14, 1934.

A bridge-piece 1 is arranged between the ends of the rails 2 and 3; the middle transverse section of the bridge-piece is the same as that of the rails, but the lower flange 4 is wider than the flanges 5 of the rails. The head of the bridge-piece is machined so that its running surface is gradually curved in elevation from its ends to its centre. Two fishplates 6 are bolted by means of bolts 7 to the bridge-piece, and to the rails 2 and 3, by bolts 8. The bridge-piece 1 and the rails 2 and 3

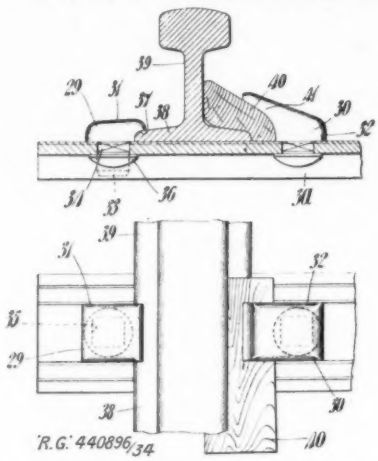


rest on a common tie-plate 9 carried by the sleepers 10 and 11. The rail ends 2 and 3 are secured to the sleepers 10 and 11 by coach screws 12 which pass through holes in the tie-plate 9, while the bridge-piece 1 is fixed to the sleepers 10 and 11 by screws 13 which pass through holes in the flange 4 and in the tie-plate 9. The sleepers are rigidly connected by the tie-plate 9 and horizontal bolts. A gap 3 is left between each end of the bridge-piece and the adjacent rail end. This gap extends the full depth of the rail and is only half the usual gap for this type of rail. The ends of the bridge-piece are arranged below the running surface of the rail, which is in alignment with the centre surface of the bridge-piece. As there is one common running surface, "easing" rails or "easing" fishplates are unnecessary. As a wheel rolls on to the bridge-piece it encounters the rising surface of the bridge-piece, so that the wheel springs are compressed and the load on the wheel as it passes on is relieved. Before the springs have recovered so as to transmit the load to the wheel again, the wheel has passed from the bridge-piece on to the following rail. Further, as the bridge-piece is firmly connected to the fishplates, tie-plates and sleepers, undesired creep of the rails is avoided to a considerable degree.—(*Accepted December* 20, 1935.)

No. 440,896. Improved Means for Securing Rails to Metal Sleepers

Ferdinand Richards, of Glanaraeth, Baglan Road, Port Talbot, Glamorganshire, and The British (Guest Keen Baldwins) Iron & Steel Co. Ltd., of the Port Talbot Steel Works, Port Talbot, Glamorganshire. July 13, 1934.

The sleeper 3*a* is of channel-shaped cross-section the upper part being pro-

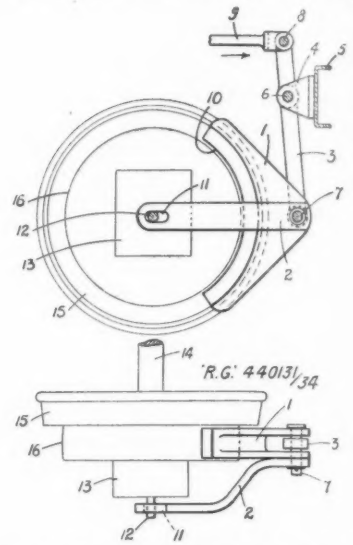


vided with longitudinal grooves so as to form a non-skid surface. The centre part is flat and forms a seating for the head portions 29 and 30 of rail clips 31 and 32. These clips are formed with an integral stem or shank 33 which is shaped at its upper part with a squared portion 34 fitting a correspondingly shaped hole 35 in the sleeper 3*a*. The stem 33 is then riveted over so as to assume the form 36, thus holding the clip 31 against the surface 28, and also preventing it from rotating. The head portion 29 of the clip 31 is undercut at 37 for the purpose of gripping the base flange 38 of a rail 39. The other margin of the base flange 38 is held by a wedge 40 which engages beneath an undercut portion 41 formed on the head 30 of the clip 32, the stem of which is shaped and riveted over similarly to the stem of the clip 31. In this way the rotation of the clip is avoided during the insertion of the wedge 40.—(*Accepted January* 8, 1936.)

No. 440,131. Improvements in Braking Apparatus

Arthur William Simmons, and The Westinghouse Brake & Saxby Signal Co. Ltd., both of 82, *York Road, King's Cross, London, N.*1. *September* 25, 1934.

A brake block 1 is rigidly secured to a curved arm 2 and suspended from the vehicle by a lever 3 pivoted at a point 6 on a bracket 4 on the frame member 5 of the vehicle. The point 6 is almost vertically above a pin 7 connecting the lever 3 to the brake block. The lever 3 is connected at its other end 8 through a rigging member 9 to a fluid pressure brake mechanism. The arm 2 extends in a radial direction with respect to the wheel, and is provided with a slot 11 into which extends a pin 12 projecting from the axlebox 13 and coaxial with the wheel axle 14. When the frame of the vehicle descends with respect to the wheels and the brake drums, the brake block 1 will be moved with respect to the wheel 15 through the intermediary of the lever 3 from which it is suspended, but the brake block 1 will follow a circular path concentric with the brake drum 16, owing to the arm 2 to which the brake block is secured. When an effort is applied to the brake-rigging member 9, the brake block 1 will be moved towards the brake drum 16 by the lever 3, and this movement of the brake block will be in a radial direction owing to the radially extending



arm 2, this movement being permitted by the slot 11.—(*Accepted December* 20, 1935.)

COMPLETE SPECIFICATIONS ACCEPTED

440,436. Michelin & Cie. Method of operating track relays in railway signalling systems and devices for use therewith.

440,622. Timken Roller Bearing Company. Bearing-race members, wheel hubs, and other members for securing them on shafts or axles.

440,646. Cassel, H. S. Means for transferring trucks to and from train ferries.

440,765. General Railway Signal Company. Systems for the remote control of railway track switches and signals.

440,833. Gales, Sir R. R. Fishplates for railway rail joints.

440,847. Lorenz Akt.-Ges., C. Electrical safety system for railway crossings.

440,925. Soc. Italiana Pirelli. Spring suspensions, buffers, traction hooks and the like.

440,937. Kellett, W. P. Shock-proof container wagon.

440,987. Maschinenfabrik Esslingen. Double-seat valve for high pressure and high temperature, in particular for controlling steam locomotives.